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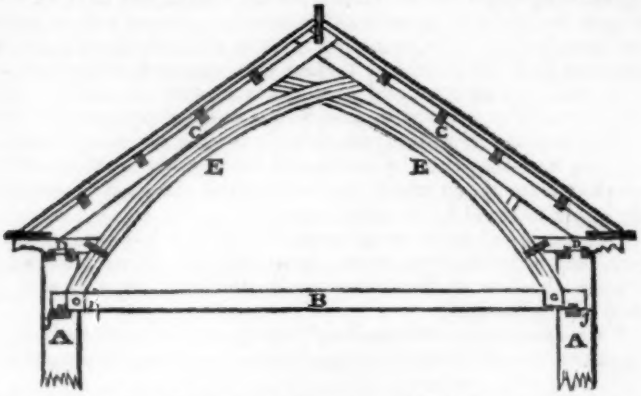
An improved construction of a Roof, by A. H. Holdsworth, Esq.



Sir,—Conceiving that every improvement of importance in house building, must necessarily be of some interest to the majority of your readers; and being desirous of contributing my feeble aid to the support of your valuable publication, I send you a sketch of an improved form of Roof, invented by A. H. Holdsworth, Esq.; for which that gentleman received the large silver medal from the Society of Arts. As an account of his invention is given in 'The Transactions of the Society,' in Mr. Holdsworth's own words; I shall avail myself of his observations in the description of it.

The advantages which this method affords, are the saving of a considerable proportion of the timber usually employed, and the gaining for useful purposes the whole space that is contained within the

roof. Mr. Holdsworth constructed a roof of this kind over the dwelling-house of a friend of his, and notwithstanding his walls were only six feet above his upper floor, he has obtained in consequence good lofty rooms, whilst the outside of his house appears very low; his barns, hay lofts, &c. are built on the same plan.

"A A, represents the walls of the house, and B one of the timbers of the uppermost floor, resting on the sleepers *f f*, which are let into the wall; over two other sleepers laid in the top of the wall, are fitted two pieces of wood D D. The principal rafters C C, forming each pair, are then secured at the bottom, into the pieces D D, and are fastened to each other at the top by iron pins. Each pair of the principal rafters C C, is supported by two arch pieces E E; these pieces are *in their grain*, and are formed on the plan recommended by Mr. Hookey, of the king's yard, at Woolwich, to whom the country is so much indebted for this method of converting the timber. They are cut lengthways, by a saw, into three pieces, to within two feet of one end, are then placed in a steam kiln, and boiled until they will bend freely, when they are fixed to a mould, and left to cool, after which a few pins of wood are driven through them to keep the pieces so cut from again flying open. The arch pieces will get a little out of shape when taken from the mould, but will be easily brought back, and when secured under the principal rafters, will fit the more firmly. The lower end of these arch pieces are inserted in the beam B of the floor, and therein firmly pinned, while at the top they cross one another, and each butts against its opposite rafter. They are further secured by iron straps to the short pieces D D, on which the principal rafters rest, thus preventing the latter from sinking and thrusting out the walls, and making the whole a stiff and complete framing, on which the longitudinal rafters, and transverse pieces are fastened in the usual manner.*

"The roofs of barns or other buildings that have only a ground floor, may be constructed in the same way, care being always taken to bring the feet of the arch-pieces so far down the wall as to give them a firm bearing.

"Mr. Holdsworth having already constructed several roofs of great widths on the plan described, expresses his entire confidence of being

* In the middle of a building, where four principal and as many arch pieces meet, and consequently cannot cross each other as represented in the enclosed drawing, Mr. Holdsworth employs a sort of short king-post, which is suspended to the principal rafters by their being morticed into it; and the upper ends of the four arch pieces are let into mortices at the lower end of the post, where they all meet and are secured.

In a common hay-loft, or cottage, the same advantages may be obtained by letting the principal rafters rest on short pieces of wood; which may, as before described, be attached by a strap of iron to another piece going from the beams of the floor to the middle of the principal rafter immediately under the couple beam, where it may be secured. It may be of straight timber; but in the country, where there is always crooked timber enough about a farm of no use for house work, this will be employed to greater advantage, as it will save what is of more value to the carpenter, and at the same time will give more space in the room.

able to apply the same principle to a roof of any given span for which timber of sufficient length could be procured.

"This elegant improvement, which does away with all those inconvenient timbers in roofs of the ordinary construction, called king-posts, queen-posts, braces, &c. &c. consequently leaves the whole space (as before observed,) which is usually employed to no useful purpose, for the making of good lofty rooms, besides effecting a considerable saving in timber. [*Register of Arts.*

Description of a Bow and Spring Rafter, by Mr. Smart.

Fig. 1.

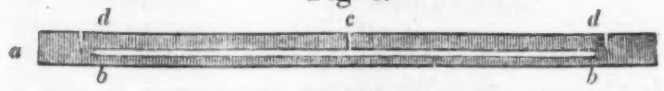


Fig. 2.

This very neat, simple and effectual method of constructing the rafters for a nearly flat roof, was invented by Mr. Smart, of the Ordnance Wharf, Westminster Bridge. The following communication, together with a model, was sent by him to the Society of Arts, for which he received its honorary reward.

"Having long been convinced of the great utility of flat roofs, especially in London and other great towns, where space is very valuable, I have for some time turned my attention to the discovery of the most economical and effectual method of constructing them. After various experiments, I ventured to put my plans in execution on a large scale, at the premises whence this letter is dated; and the highly satisfactory result of this trial, induces me to communicate some particulars of it to the Society of Arts, &c. Over the rafters I nailed down very strong laths, with moderate intervals between each, and laid upon them a platform of bricks bedded in cement; the bricks are covered by a layer of foot tiles laid in cement, having the joints pointed with mastic cement, and their upper surfaces twice coated with linseed oil, laid on boiling hot. The roof, although on a superficial view it appears flat, has yet sufficient declination towards the sides to allow the free escape of water; and from an experience of several months, I have reason to be entirely satisfied with its soundness. Its cost is not more than half the price of lead, and the only objection that can be urged against it, is its weight. To counteract this, I have made an alteration in the form of my rafters, which I find to be effectual; and a description of which I subjoin, as well as a model.

"I take a square spar of the usual size for a rafter, and by means of a circular saw, make an incision along it as represented in Fig. 1; I then make the cut *c*, at right angles to the former, and equi-dis-

tant from the two ends *a a*; lastly, I make the two cuts *d d*, taking out a thin wedge from each place. The two pieces *c d*, are then to be gently raised up till they form an angle of 10° or 12°, with the piece *b b*; and are secured in their place by the insertion of a key-wedge *e*, of seasoned oak, as represented in Fig. 2. It is obvious that a weight pressing on the key-wedge of this rafter, (the ends being properly supported) will be sustained till either the fibres of the wood forming the string are drawn asunder, or till the lateral cohesion of the wood forming the butt ends of the rafters are destroyed; at the same time there is no lateral pressure on the wall or other support."

"Ordnance Office, Westminster Bridge,
"April 24, 1824."

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*Observations on Alloys, or Mixtures of Metals.**

In Chemistry, and in the Arts, we generally mean by *alloys* the combination of two or more metals; but the alloys with mercury bear the particular name of *amalgams*. Thus, when we say, the amalgam of bismuth, the amalgam of silver, &c. we thereby understand the alloy of mercury with bismuth, of mercury with silver, &c.

The number of alloys known, and used, are very considerable: we will endeavour generally to explain their compositions. Many of them, however, form the principal objects of certain manufactures.

A metal will not alloy indifferently with other metals; there are a certain number with which it is impossible to form a union, whilst a marked affinity exists between others: but when the combination is possible, it appears susceptible of being effected in any required proportion; at least they have not found out, at present, any character which indicates the point of saturation; so that this kind of combination may be compared, in a certain degree, to the solutions of salts in water. Alloys, however, possess properties which do not appear to be derived from their component parts, and which denote that they are not merely simple mixtures.

Alloys, compared with the metals which enter into their composition, present the following characters.

In general, they are less ductile; and we know many instances of very soft metals, which, by their union, form an alloy exceedingly brittle. The contrary happens in respect to their hardness: this is, in general, more considerable; with the exception, however, of all kinds of amalgams.

It is very rare that the specific gravity of an alloy will be a mean between those of the metals alloyed; and, what is very remarkable, their density is sometimes less, and sometimes greater, than the mean density: thus the volume of an alloy is either less or greater than the sum of the volumes of its constituent parts. We will present our readers with a table, which we have extracted from the *Chimie Elémentaire*, of M. Thénard: this table comprises a great number of binary alloys, divided into two series; one whose density is greater, and the other less than the mean.

* From the *Dictionnaire Technologique*.

Alloys whose densities are *greater* than the mean densities of their constituent metals.	Alloys whose densities are *less* than the mean densities of their constituent metals.
Gold and zinc.	Gold and silver.
Gold and tin.	Gold and iron.
Gold and bismuth.	Gold and lead.
Gold and antimony.	Gold and copper.
Gold and cobalt.	Gold and iridium.
Silver and zinc.	Gold and nickel.
Silver and lead.	Silver and copper.
Silver and tin.	Copper and lead.
Silver and bismuth.	Iron and bismuth.
Silver and antimony.	Iron and antimony.
Copper and zinc.	Iron and lead.
Copper and tin.	Tin and lead.
Copper and palladium.	Tin and palladium.
Copper and bismuth.	Tin and antimony.
Lead and antimony.	Nickel and arsenic.
Platina and molybdena.	Zinc and antimony.
Palladium and bismuth.	

It is very difficult to foresee the degree of fusibility of an alloy; for it has not, as we may say, any analogy with the degree of fusibility of the metals composing it. We have a very remarkable example in the fusible alloy, which is composed of eight parts of bismuth, five of lead, and three of tin. This alloy, which melts at the temperature of boiling water, may be rendered still more fusible, by adding a small portion of mercury: it is then used for anatomical injections: the dentists likewise make use of it, to fill up the cavities of carious teeth.

The colours of alloys, also, do not depend in any manner upon the colours of the metals which are united together. Thus, the colour of copper, instead of being diminished by the addition of a certain proportion of zinc, is, on the contrary, singularly increased; whilst a very small quantity of silver is sufficient to cause the colour of gold entirely to disappear.

The foregoing observations clearly demonstrate that there is really a combination between those metals which alloy together.

There exist natural alloys; but we shall now only treat on those which are formed: and of these, only such as are in use.

In alloying metals with each other, we derive the same advantages as if we posessed a much greater number of primitive metallic substances, each possessing its peculiar qualities. Thus one alloy will form a metal possessing the property of being solid at the ordinary temperature, and, at the same time, experiencing fusibility in a greater degree than any other. Another alloy forms a brittle and sonorous metal, which may be employed in the manufacture of bells, cymbals, &c. Another will be susceptible of receiving the most beautiful polish, and become fit to be manufactured into metallic mirrors, &c. It is, then, in a manner, multiplying metals, and their uses, in multiplying alloys. This part of chemistry has not, perhaps, been

sufficiently cultivated, in all its applications. The labours of *Gellert* and *Black* have added a little to our knowledge on the subject. We know well, that such a metal will unite with such another; but not, in what respective proportions of their component parts the alloy will afford the most advantageous qualities: this is only known of a very small number: and the same observations may also be applicable to the ternary and quarternary alloys. How many combinations, indeed, of the metals recently discovered, have not been at all studied; as far, at least, as respects their utility; but of which, perhaps, the smallest quantity would be sufficient to give useful and even precious qualities to certain other metals! We have had a very striking example, in the attempts which have been made to imitate *wootz*.

There are some general rules in the making of alloys, which are indispensably necessary to be known, in order to ensure success. As alloys, then, can only be obtained by fusion, and as the requisite temperature to produce them may be that at which the metals may oxidate, it is essential to preserve them, as much as possible, from the action of the air. For this purpose, various means are employed, according as the metals to be alloyed are more or less fusible or oxidable. Thus, tin and lead, for example, require only to have a little resin, suet, or oil, thrown into the melting-pot, when the metals begin to fuse; and then to be stirred with a small iron rod. If any metallic portions should be oxided, they are immediately reduced by the hydrogen and the carbon of these combustible substances. If we would alloy iron with tin, this alloy requires a much more elevated temperature than the former, to bring it to a state of fusion, even with the aid of the tin, and the substances which we have above mentioned would both be burnt, before the alloy could be effected. We are obliged, in this case, therefore, to have recourse to a *flux*, which forms a kind of bath, entirely surrounding the metal, and thereby preserving it from coming into contact with the air. When it is supposed that the fusion is effected, the alloy must be well stirred together, to render all its parts perfectly homogeneous.

Whenever there exists a considerable difference in the specific gravities of the metals which we would combine, we frequently experience the greatest difficulty in obtaining an alloy perfectly similar in all its parts; each of the metals being apt to separate in the order of its density; which renders it necessary to stir it well, until the moment it is poured out. When we operate on large quantities, the length of time which the matter takes to cool is sometimes sufficient for this separation to manifest itself afresh. This inconvenience takes place, especially, in the founding of bells and pieces of artillery. If the alloy, however well it may have been mixed, does not present the desired uniformity, after the first founding, it is broken to pieces, and again submitted to the melting-pot. By this means the whole becomes completely homogeneous.

It is frequently found to be very difficult to alloy three or more metals together; either because one of them may be less fusible or more oxidable than the others; or, that the affinity which forms their union may not be sufficiently strong; in the latter case, we often

succeed best by not fusing each metal separately, as is usual; but by combining them two and two, and afterwards forming them into a single alloy. It is frequently very troublesome to alloy, in a direct manner, a small portion of iron with bronze; but if, instead of iron, we use tinned iron, the combination will be immediately effected, and the bronze, by this addition, will acquire its proper quality. Also, to render brass more fit for certain uses, it is requisite to add to it a small quantity of lead: but this cannot be effected in a direct manner; for, according to the observations of M. Chaudet, we should then succeed very imperfectly. It is therefore preferable, as he recommends, first to fuse the lead with zinc, because these two metals easily combine; and afterwards to add the copper to the first alloy, in order to obtain the desired result.

We have before observed, that the difference in fusibility is also an obstacle to a combination; and this obstacle is so powerful, that we sometimes derive from it great advantage, in decomposing certain alloys: this happens in the process of *liquation*. This operation is intended to separate any silver which may be united to copper; for which purpose they add a certain proportion of lead. There results an alloy, composed of very different elements, in respect to their fusibility: this alloy is exposed to a heat just sufficient to melt the lead, which liquefies, and carries with it almost the whole of the silver;—the difference in the oxidability then affording the means of separating one of these metals from the other.

These general observations we have thought necessary to give, on the making of alloys. We shall now make some remarks on some of the various alloys used in the Arts.

One of the most useful alloys (for it is chiefly on this account that we treat on the subject) is that of zinc and copper: it is more ductile and less oxidable than copper itself; and offers, in this point of view, very great advantages indeed: there is not any alloy more employed. This alloy may be made in various proportions; and, as it then assumes different qualities, different denominations are also assigned to it. Thus we know it by the names of yellow copper, brass, pinchbeck, *similor*, Prince Rupert's metal, Manheim gold, &c.

Copper and tin form, by their union, an alloy equally valuable, which is known by the names of bell-metal, bronze, gun-metal, &c. This alloy is manufactured on the large scale, for bells, pieces of cannon, &c. Gold and silver, in their pure states, are too soft to be manufactured into vessels and durable coin: they must be alloyed with a litte copper, in proportions regulated by law.

When we wish to unite various pieces of metal, it is done by the well-known process of soldering; which consists in uniting their surfaces by means of an alloy interposed, and which, of course, must be much more fusible than the metal which composes the article to be soldered. This solder, or alloy, must also be formed of metals susceptible of easy combination with those to be united. We see by this, that each metal requires a particular kind of solder: thus, the solder for gold vessels, or jewellery, is an alloy of gold and silver, or gold and copper; that for silver, an alloy of silver and copper; that

for copper is either of pure tin, for articles which are not intended to be set on the fire, or of an alloy which is called *hard solder*, which is composed of tin and copper:* the solders for tin and for lead are alloys of these two metals, &c. The respective proportions of the component parts of these alloys are greatly varied, according as a greater or less degree of fusibility is required: thus, for very delicate articles, the alloy is rendered as fusible as possible. For the purpose of economy, workmen in preparing their solder, frequently make use of the greatest proportion of that metal which is the cheapest. The solder known by the name of *plumber's solder* is composed of one part of tin, and two of lead.

In order to preserve certain metals from the action of the air, and from various other agents which might corrode them, they are covered with a metal less alterable, and which renders them fit for the construction of various instruments and utensils. This may be considered as a real alloy, but only at the point of contact of the two surfaces: in every other respect the two metals are perfectly independent of each other. This is, as it were, a solder without an intermedium. Tinning, gilding, and silvering, are of this kind. The two last are more frequently used as objects of luxury, than as preservatives.

We must observe, before terminating this article, that we cannot exactly apply what we have above stated to the silvering of glass; for here, one of the two metals being liquid, and the two layers excessively thin, they reciprocally penetrate, and mix together into an homogeneous mass. We well know that the silvering on glass answers quite a different purpose to any other preparation which we have mentioned; as, instead of this silvering preserving the surface to which it is applied, it is, on the contrary the plate of glass which guards it, and preserves to it that beautiful polish which prevents the luminous rays from penetrating, and causes them to be reflected from within.

A brazier of Paris, named *Biberel*, proposed, some years since, to substitute, in common tinning, instead of fine tin, an alloy made with eight parts of tin and one of iron. This process was far more advantageous than that formerly in use, and the tinning lasted for a much longer time. It appears, however, that the workmen entrusted to execute it, either did not understand the management of it, or were guilty of some great dishonesty. Certain it is, that this kind of tinning is no longer in use: it is, however, much to be lamented, that an invention so important and useful should be entirely abandoned.

It is extremely difficult to alloy iron and tin together; and it is therefore probable, that persons unaccustomed to this kind of operation would endeavour to use pure tin, expecting the tin to alloy with the iron. Perhaps the abandoning of the new process may be chiefly owing to this circumstance.

An alloy of iron and tin is obtained in this manner. The clippings

* The hard solder for copper, is generally formed of zinc and copper. [*Editor.*

of iron are to be put into a crucible, and covered all over with powdered glass: the crucible is then placed in a wind-furnace, and heated to a high red;—at this period the fine tin is plunged in the iron, and very soon melts: the mixture must then be briskly stirred together. It is again covered with ground glass, and the crucible closed. When the whole is completely red, it must receive another good stirring, then another heating, and afterwards be run into an ingot mould. It is very probable that still better success might be obtained by substituting *tinned iron*, instead of clippings of iron.

This alloy enters into fusion at a low red heat; and if it be brought into contact with the surface of a plate of copper slightly heated, with the assistance of sal-ammoniac it melts immediately, and may be spread over the surface by rubbing it with tow, as easily as if it were pure tin only.

Lead is much too soft to be employed for many purposes, but it readily attains whatever hardness may be desired, by alloying it with a greater or less quantity of antimony, according to the purpose for which it is designed. In the proportion of a sixth part of antimony, or even a twelfth part, the alloy is harder and more fusible than lead; still, however, preserving its malleability. When these two metals are combined, in the proportion of one of antimony and four of lead, it forms the basis of the metal employed in making printing-types. Each type-founder may somewhat vary his proportions; having, as we may say, his own peculiar receipt, of which he makes a secret. Those who sell at the lowest price use the greatest proportion of lead; but then the faces of the letters soon lose their sharpness; and, after being used a short time, the types give way under the press, and become what is called *battered*. When, on the contrary, a good and durable type is desired, we not only use the whole quantity of antimony mentioned, but also add a little copper.

The alloy made use of at Paris for water-cocks, is analogous to that which we have been describing; only the proportions of lead are greater: and when the antimony, best known by the workmen under the name of *regulus*, is dear, zinc is partly substituted for it. This metal, in fact, always gives lustre and hardness to lead, and even makes it somewhat sonorous.

Arsenic, alloyed with the greater part of the metals, even in a very small proportion, renders them extremely brittle, and liable to break: it also increases their fusibility. These alloys are easily decomposed, at a temperature more or less elevated; especially if the operation be performed in contact with the air. We derive great advantages from this property of arsenic in the manufacture of platina; the two metals are fused together, but the alloy is freed from the arsenic by a gradual calcination; and accordingly as the platina becomes porous, it is condensed by being submitted to a very strong pressure. But since the mineral acids have diminished in value, we prefer to treat the platina in the humid way, because the platina is hereby obtained much purer and more malleable.

In the manufacture of certain utensils, an alloy is made, to which the name of *white copper* is given: it is formed of nearly ten parts of copper and one of arsenic: it is obtained by directly fusing the arsenic with the copper, or treating it with arseniate of potash; always taking the precaution of properly defending the alloy, during its fusion, from the contact of the air. It is very seldom that the colour of the copper becomes completely extinct at the first fusion: it must then be returned into the melting pot, and a fresh quantity of arsenic be added; and, finally, we obtain a white alloy, resembling silver; but it is very brittle.

We shall now relate some new and very interesting experiments on the subject of *steel*;—the pursuit of which must not be abandoned, until the desired end is attained. The *Society of Encouragement* has set apart funds for these important researches; and has nominated an especial commission, who are indefatigable in their attentions to the subject. We have, therefore, great reason to hope that we shall soon see, in France, vast improvements in this branch of manufacture.

The following are the most important results, which have been obtained at present.

In England, Messrs. Stodart and Faraday have formed an alloy possessing all the characters of the best steel of Bombay. These chemists commenced their operations by forming a carburet of iron, which contained 94,36 of iron, and 5,64 of carbon: this carburet, powdered, and exposed to an extremely intense heat, in union with pure alumine, formed an alloy of a white colour, and of a very close grain. The proportion of carbon in it was so diminished, that it could scarcely be appreciated. This body had been replaced, in this experiment, by 6,4 of alumine, or probably by its base. Forty parts of this compound of iron and alumine, being fused with 700 parts of good steel, afforded a new alloy; which, on being corroded by acids, became damasked like *wootz*.

Steel and silver are very difficult to alloy; as, although, when in fusion, they may be homogeneous, yet they separate, the one from the other, on cooling; unless when these two metals are combined, in the proportion of 1 part of silver and 500 of steel; they then produce a perfect alloy, superior to the best steel of India. This result is too remarkable, not to be confirmed on the large scale.

The same authors also speak of an alloy, obtained by fusing equal parts of steel and platina, which was capable of receiving the finest polish, and was not susceptible of being tarnished by the action of the air. The colour of this alloy is the most brilliant and advantageous that can be desired for the manufacture of mirrors. Rhodium, combined with steel in the proportion of from one to two per cent., furnishes an alloy, of excessive hardness and tenacity.

In France, M. Bertier, Professor in the Royal School of the Mines, has obtained an alloy of chrome and steel, in the proportion of 0,010 of the latter, to 0,015 of the former. This alloy was very remarkable, for the facility with which it could be wrought; and for the beautiful silvery damask, which it furnished, on being corroded by sulphuric acid.

M. Boussingault, a mineralogical pupil in the School of *Saint Etienne*, has made a series of experiments; the result of which is, that silicum is a constituent part, and more essential to the existence of steel than even carbon. This ingenious scholar has repeated, with much care, the experiments of Clouet on the transformation of iron into steel, by means of a mixture of argil and calcareous carbonate; and has obtained the same result, by substituting pure lime for its carbonate,—that the steel obtained, in either case, does not contain any appreciable quantity of carbon, but much silicum. M. Boussingault has also assured us, that the iron, during its cementation, robs the charcoal of a portion of the silex which it contained.

If, as we have reason to believe, these experiments are correct, they merit our attention in all respects.

On rendering Fish Oil and Linseed Oil drying; and on making cheap Oil Paints. By MR. T. VANHERMAN.

From the Transactions of the Society for the Encouragement of Arts, &c.

Having applied a great portion of my time, for several years past, to discover a method of preparing a cheap and durable composition for the defence and preservation of all work exposed to the inclemency of the weather, I have now the satisfaction of laying before the Society for the Encouragement of Arts, &c. specimens of some of the colours ready prepared for use, which will, I flatter myself, be found superior to all others for cheapness and durability, equal to any in beauty, and not be subject to blister or peel off from the heat of the sun.

The vehicle made use of for the said paints is fish-oil, the preparation of which is so simple, that, when known, gentlemen who have large concerns to paint, may have this composition of any colour manufactured, and laid on by their labourers.

I have sent a bottle of the prepared oil, also a number of patterns of paints, of various colours. The highest price of any does not exceed three-pence per pound, and many of them are so low as two-pence, in a state fit for use. I have likewise sent a pot of white lead, which has been ground with prepared fish-oil; and which, when thinned with linseed-oil, surpasses any white hitherto made use of for resisting all weathers, and retaining its whiteness. I hope my humble endeavours will merit the approbation of the Society, before whom I will, at any time they shall please to appoint, make the various experiments they may require.

Relying on your encouragement, I am, Gentlemen, with due respect, your most obedient humble servant,

THOMAS VANHERMAN.

To refine one Ton of Cod, Whale, or Seal Oil, for Painting, the following ingredients are used.

One ton of fish oil, or 252 galls.	12 lbs. white copperas†
32 galls. of vinegar	12 galls. of linseed oil
12 lbs. litharge*	2 galls. of spirit of turpentine.

* The vitreous oxide of lead. † Sulphate of zinc.

To prepare the Vinegar for the Oil.

Into a cask which will contain about forty gallons, put thirty-two gallons of good common vinegar; add to this twelve pounds of litharge, and twelve pounds of white copperas in powder; bung up the vessel, and shake and roll it well twice a day for a week, when it will be fit to put into a ton of whale, cod, or seal oil; (but the Southern whale oil is to be preferred, on account of its good colour, and having little or no smell;) shake and mix all together, when it may settle until the next day; then pour off the clear, which will be about seven-eighths of the whole. To this clear part add twelve gallons of linseed-oil, and two gallons of spirit of turpentine; shake them well together, and after the whole has settled two or three days, it will be fit to grind white-lead and all fine colours in; and when ground, they cannot be distinguished from those ground in linseed oil, unless by the superiority of their colours.

If the oil is wanted only for coarse purposes, the linseed-oil and spirit of turpentine may be added at the same time that the prepared vinegar is put in; and after being well shaken up, it is fit for immediate use, without being suffered to settle.

The vinegar is used to dissolve the litharge, and the copperas accelerates the solution and increases the drying quality.

The residue, or bottom, when settled, by the addition of half its quantity of fresh lime-water, forms an excellent oil for mixing with all the course paints for preserving outside work.

Note.—All colours, ground in the above oil, and used for inside work, must be thinned with linseed-oil and spirit of turpentine.

☞ The oil mixed with lime water, I call *incorporated oil.*

The method of preparing various impenetrable Paints.

FIRST—*Subdued Green.*

Fresh lime-water, 6 gallons,	Wet blue, 20 do.
Road dust, finely sifted, 112lbs.	Residue of the oil, 3 gallons,
Whiting, 112lbs.	Yellow-ochre, in powder, 24lbs.
Blue-black, 30 do.	

This composition will weigh 368 pounds, which is scarcely one penny per pound. To render the above paint fit for use, to every eight pounds add one quart of the incorporated oil, and one quart of linseed-oil; and it will be found to be a paint with every requisite quality of beauty, durability, and cheapness; and, in this state of preparation, does not exceed two-pence half-penny per pound; whereas the coal-tar paint of the same colour is six-pence per pound.

The method of mixing the Ingredients for the Subdued Green.

First, pour six gallons of lime-water into a large tub, then throw in 112 pounds of whiting; stir it round well with a stirrer; let it settle for about an hour, and stir it again. Now you may put in the 112 pounds of road-dust, mix it well; then add the blue-black, after which, the yellow-ochre; and when all is tolerably blended, take it out of the tub, and put it on a large board or platform, and with a labourer's shovel, mix and work it about as they do mortar. Now

add the wet blue, which must be previously ground in the incorporated oil, (as it will not grind or mix with any other oil.) When this is added to the mass, you may begin to thin it with the incorporated oil, in the proportion of one quart to every eight pounds; and then with the linseed-oil, in the same proportion; and it is ready to be put into casks for use.

Lead Colour.

Whiting, 112lbs.	Road-dust, 56lbs.
Blue-black, 5 do.	Lime-water, 5 gallons,
Lead, ground in oil, 28 lbs.	Residue of the oil, 2½ do.

Weight 256lbs.

To the above add two gallons of the incorporated oil, and two gallons of linseed-oil to thin it for use, and it will not exceed the price of 1¾*d.* per pound.

Note.—The lime-water, whiting, road-dust, and blue-black, must be first mixed together; then add the ground lead, first blending it with two gallons and a half of the prepared fish-oil; after which thin the whole, with the two gallons of linseed oil, and two gallons of incorporated oil, and it will be fit for use. For garden-doors, and other work liable to be in constant use, a little spirit of turpentine may be added to the paint whilst laying on, which will have the desired effect.

Bright Green.

112lbs. yellow-ochre, in powder,	6 gallons lime-water,
168 do. road-dust,	4 do. fish-oil, prepared,
112 do. wet blue,	7½ do. incorporated oil,
10 do. blue-black,	7½ do. linseed-oil.

Weight 592lbs.

This excellent bright-green paint does not exceed three-pence farthing per pound, ready to lay on; and the inventor challenges any colour-man or painter to produce a green, equal to it, for eighteen-pence per pound.

After painting, the colour left in the pot may be covered with water, to prevent it from skinning; and the brushes, as usual, should be cleaned with a painter's knife, and be kept under water.

A brighter green may be formed by omitting the blue-black; and *A lighter green* may be made by the addition of ten pounds of ground white-lead.

A variety of greens may be obtained by varying the proportions of the blue and yellow.

Observe, that the wet blue must be ground with the incorporated oil, preparatory to its being mixed with the mass.

Stone Colour.

Lime-water, 4 gallons,	Prepared fish-oil, 2 gallons,
Whiting, 112lbs.	Incorporated oil, 5½ do.
White-lead, ground, 28lbs.	Linseed-oil, 3½ do.
Road-dust, 56lbs.	

Weight 293lbs.

The above stone colour, fit for use, is not two-pence per pound.

Brown Red.

Lime-water, 8 gallons,	Four gallons of fish-oil,
Spanish brown, 112lbs.	Four do. incorporated oil,
Road-dust, 224lbs.	Four do. linseed-oil.
Weighs 501lbs.	

This most excellent paint is scarcely three-half pence per pound. The Spanish brown must be in powder.

A good chocolate colour, is made by the addition of blue-black in powder, or lamp-black, till the colour is to your mind; and

A light brown, may be formed by adding ground white-lead.

Note.—By ground-lead is meant white-lead ground in oil.

Yellow, is prepared with yellow-ochre in powder, in the same proportion as the Spanish brown.

Black, is also prepared in the same proportion, using lamp-black, or blue-black.

To Whiten Linseed-oil.

Take any quantity of linseed-oil, and, to every gallon, add two ounces of litharge; shake it up every day for fourteen days; then let it settle a day or two; pour off the clear into shallow pans, such as dripping pans, for instance, first putting half a pint of spirit of turpentine to each gallon: place it in the sun, and, in three days, it will be as white as nut-oil.

This oil, before it is bleached, and without the spirit of turpentine, is far superior to the best boiled oil; there is no waste, and it has no offensive smell.

Note.—From experiments made, it appears that fine sand will not answer the purposes of road-dust in painting; and that this dry dust, collected in high-ways much travelled by horses and carriages, and afterwards finely sifted, is the article recommended, as possessing the properties required.

I here subjoin a receipt for a constant white, for the inside painting of houses; which paint, though not divested of smell in the operation, will become dry in four hours, and all smell be gone in that time.

A Constant White Paint.

To one gallon of spirit of turpentine, add two pounds of frankincense; let it simmer over a clear fire until dissolved; strain it, and bottle it for use. To one gallon of my bleached linseed-oil, add one quart of the above, shake them well together, and bottle them also. Let any quantity of white-lead be ground with spirit of turpentine very fine, then add a sufficient portion of the last mixture to it, until you find it fit for laying one. If in working, it grows thick, it must be thinned with spirit of turpentine. It is a flat or dead white.

Certificates of the superior excellence of the above paints accompany the original paper.

ON ENGRAVING.

(From the Mechanic's Gallery, By C. F. Partington.)

History of the Art.

It has been truly observed, that, "among the various arts which belong to the gradual development of human ingenuity, and have decorated the fair fabric of civilized society, that of engraving is one of the most ancient." It was the earliest mode which the mind suggested, and the hand of man attained, of imparting useful information, and of displaying ornamental art: indeed the principal part of our knowledge relative to the otherwise dark regions of remote antiquity, has been transmitted by records engraven on stone or metal.

Turning, however, from the flowery field of antiquarian lore; it may be enough for our present purpose, to shew that the mechanical execution of the art had attained a considerable degree of perfection at a very early period, and an illustration of this fact will be found in the Babylonian bricks that have been preserved, and which bear evident marks of an operation, nearly similar to that of the graver.

The first accounts we meet with of engraving on copper is from some German annals, about the year 1450. The earliest copper-plate extant is dated 1461, which, notwithstanding its rudeness and imperfections, sufficiently evinces that the engraver was no stranger to the use of his instruments: and the copper-plate printer far from being unpractised in his art: from several other engravings of the same master, we may discover, that the printing of these plates had become a mechanical profession: the impressions are so clearly taken in every part, that it is a doubt whether they could be exceeded by the copper-plate printers of the present day, with all the conveniences they now possess, and the additional knowledge they must necessarily have acquired in the course of between three and four centuries.

"Hence," Mr. Strutt says, "we may fairly conclude, that if they were not the first specimens of the engraver's workmanship, they were much less the first efforts of the copper-plate printer's ability. It is likewise to be observed, that Martin Schoen, who is said, with great appearance of truth, to have worked from 1460 to 1486, was, apparently, the scholar of Stoltzhirs; for he followed his style of engraving, and copied from him a set of prints representing the Passion of our Saviour: now, allowing Stoltzhirs to have preceded his disciple only ten years, this carries the era of the art back to 1450, as was said above. There is no ground to suppose that it was known to the Italians till at least ten years afterwards. The earliest prints that are known to be their's, are a set of the seven planets, and an almanack, by way of frontispiece; on which are directions for finding Easter, from the year 1465 to 1517 inclusive: and we may be well assured that the engravings were not antedated, for the almanack, of course, became less and less valuable every year. In all probability, therefore, these prints must have been executed in the year 1464, which is only four years later than the Italians themselves lay claim to the art. The three earliest Italian engravers, are Finiguerra, Bo-

ticelli, and Baldini. If we are to refer these prints to any of the three, we shall naturally conclude them to be the work of Finiguerra or Baldini; for they are not equal either in drawing or composition to those ascribed to Boticelli, which we know, at least, were designed by him; and as Baldini is expressly said to have worked from the designs of Boticelli, it will appear most probable that they belong to Finiguerra."

With respect to the invention of etching we must speak with less certainty. Albert-durer has left us one of the most early specimens of this art, in his piece known by the name of the Cannon, dated 1518: he has also bequeathed us another etching, dated 1524, representing Moses receiving the Tables of the Law. Parmegiano soon after practised it in Italy. In his works we discover the hand of a great man, labouring under innumerable difficulties, and working, as it were, upon a system of his own invention. We cannot help admiring his efforts, though he failed in producing the forms he wished to express. On examining the mechanical part of the execution, we may plainly perceive that the subject was novel to him, and that he had had no instructions or directions: he died in the year 1540.

That species of engraving which unites etching with the use of the graver, was, no doubt, adopted very early; that is, immediately upon the invention of etching: but G. Audran was the first who carried it to perfection.

The Italians, however, have not entirely secluded themselves from their share of honour in this branch of the arts. Agostino Demusis, commonly called *Augustine of Venice*, a pupil of Marc Antonio, used it in several of his earliest works, but confined it to the flesh, as appears in the print of an old man seated on a bank, with a cottage in the back ground, without any date. Augustine flourished from 1509 to 1536. We have also another print of this nature, by Giulio Campagnola, of a single figure, standing, and looking upwards, with a cup in his hand, and said to be engraved about the year 1516; the background is executed with round dots, made, apparently with a dry point; the figure is outlined with a stroke deeply engraved, and finished with dots, in a manner greatly resembling those prints which De Marteau engraved at Paris, in imitation of red chalk. The hair and beard are expressed by strokes. Stephen De Laulne, a native of Germany, followed the steps of Campagnola; executing many of his slight works in dots only. This kind of engraving was greatly improved about the middle of the seventeenth century, by John Boulanger, a French artist, and his cotemporary, Nicholas Plattenberg; but it is only within the last fifty or sixty years that it has been deemed an object worthy of general imitation. John Lutma, as before observed, executed his works, of this kind, with a hammer, and a small punch or chissel, and was the first who practised that mode, but which was afterwards, for some time, generally followed.

Engraving in mezzotinto is a later discovery than the foregoing; invented by Prince Rupert, about the middle of the seventeenth century, though it is generally asserted that he had the secret from another.

Engraving in aqua tinta is the most modern of the whole, and does great honour to the improved state of the arts in the present age, whether we consider it with regard to the beauty of its effect, or the ingenuity displayed in the execution of the work throughout. It partakes of the excellence of most modern discoveries, and arrived at a considerable state of perfection, even while in the hands of the inventors.

Engraving in strokes, or hatches, with the tool, is, undoubtedly, the most ancient kind of engraving, and is still retained for many very useful and valuable purposes. For though etching be performed with a great deal more ease and expedition, and has several other advantages attending it; yet the strokes, or lines, are, by no means, so regular and exact as those wrought by the graver: for this reason, where great precision is required, engraving with the tool is preferred; as, in the execution of portraits, where the most minute parts must be expressed according to the original subject, without the least deviation, or varying the effect, either by that masterly negligence and simplicity in some parts, or those bold sallies of the imagination and hand in other parts, which give such spirit and force to historical painting.

Implements used in the Art.

The implements usually employed in the art of engraving on copper are few and simple; they consist of various formed gravers, a scraper, a burnisher, an oil stone, a sand bag, an oil rubber, and some good charcoal. There are, however, other instruments which we shall presently more fully examine, some of which have raised the mechanical execution of the art to a pitch of excellence superior to any thing previously known.

Gravers are small bars of steel, of a square or lozenge form, and with the short handle into which they are fitted, are about five inches long. One of the angles of the bar is always on the under side of the instrument, and the point is formed by bevelling the end from the uppermost angle. The square form is used for broad strokes, and the lozenge for fine ones. The upper end of the handle is a kind of knob, with the under side of it cut off, in order that the instrument may be used with the steel nearly in a horizontal position. The goodness of the steel, as well as its temper, is of consequence; gravers are generally over hard when first bought; but they should not be softened too hastily, as after a little grinding and whetting, they will be frequently found to answer perfectly, although in the first trial they were found defective. We may, however, remark, that if a graver will not make a mark upon common window glass, it is too soft. Towards the extremity, the graver should bend upwards a little, in order that the point may be more readily prevented from digging into the copper. The bevelled part, and the two sides which form the edge, should be rubbed upon the oil-stone in such a manner as to be quite flat. To take off any bur which may be occasioned by the whetting, the point is usually struck into a piece of box, or any other close

grained wood; and its sharpness is tried upon the nail; if it will cut the nail without leaving any jagged edge, it is fit for use.*

The dry-point or needle consists of steel wire, with a small cylindrical handle, or it may be of a sufficient length and thickness to be held without a handle. It should be tempered like a graver, and have a fine conical point; and should be entirely free from any angular edge, otherwise it cannot be drawn upon the copper in every direction, without sometimes producing a roughness which ought not to occur. The art of whetting it perfectly, though apparently a simple operation, is not acquired without considerable practice. The dry-point, when the bur which it raises is scraped off, leaves a softer and more delicate stroke than can be effected by any other means.

The scraper and burnisher are frequently made in the same piece, one at each extremity of a piece of steel, which is about seven inches long. The scraper has nearly the form of a triangular pyramid with the point cut off. It is used to remove the bur occasioned by the dry-point, and on similar occasions: any of its edges are used in this way. The burnisher is a cone, except that it is a little convex on the side; it is used to rub out scratches which appear on the plate, and to lessen the force of a line which has been cut too deep. The scraper and burnisher are each about an inch or rather more in length, and the middle part of the steel is the handle by which they are held.

The oil-stone should be a piece of the best Turkey hone, used with olive oil.

The cushion is a bag of leather filled with sand. It should be about three inches thick, and always less than the plate to be engraved. The plate is allowed to rest upon it, and may, by means of it, be more readily turned round, or in any direction, to produce the curves required.

Parallel rulers and compasses will be required as in drawing; the

* Great care is required to whet the graver nicely, particularly the belly of it, the two angles of which are to be held next the plate, flat upon the stone, and the artist must rub them steadily till the belly rises gradually above the plate, so that when you lay the graver flat upon it you may just perceive the light under the point, otherwise it will dig into the copper, and then it will be impossible to keep a point, or execute the work with freedom. In order to this, keep your right arm close to your side, and place the fore-finger of your left hand upon that part of the graver which lies uppermost on the stone. When this is done, in order to whet the face, place the flat part of the handle in the hollow of your hand, with the belly of the graver upwards, upon a moderate slope, and rub the extremity, or face, upon the stone, till it has an exceedingly sharp point, which may be tried upon the thumb-nail.

When the graver is too hard, as is usually the case, when first used, and may be known by the frequent breaking of the point, the method of tempering it is as follows: heat a poker red hot, and hold the graver upon it, within half an inch of the point, till the steel changes to a light straw-colour, then put the point into oil to cool: or, hold the graver close to the flame of a candle till it be of the same colour, and cool it in the tallow, but be careful, either way, not to hold it too long, for then it will be too soft; and in this case the point, which will then turn blue, must be hardened again. Be not too hasty in tempering, for sometimes a little whetting will bring it to a good condition when it is but a little too hard.

former should have a brass edge; and the latter should be entirely made of steel, with a spring instead of a joint at the head, and with a screw to regulate the opening of the limbs.

(TO BE CONTINUED.)

ON TANNING, LEATHER DRESSING, DYING, &c.

(Continued from p. 299.)

Saffian or Maroquin Leather.

A valuable *Saffian*, or dyed *Maroquin* leather, almost equal to that of Turkey, is prepared largely at Astracan, and other parts of Asiatic Russia. Only bucks' and goats' skins are used for this purpose. The favourite colours are red and yellow. The general method of preparing the pelt is the same as in this country for the dyed Morocco leather; that is, by lime, dogs'-dung, and bran. Honey is also used after the branning. The honey is dissolved in warm water, and some of this liquor is poured on each skin, spread out on wooden trays, till it has imbibed the whole of the honey; after which it is suffered to ferment, for about three days, and then salted in a strong brine, and hung up to dry. The skin is then ready to receive the dye, which, for red, is made with cochineal, and the *salsola ericoides*, an alkaline plant, growing plentifully on the Tartarian salt desarts, and the colour is finished with alum. When dyed, the skins are tanned with sumach. To the very finest reds, a quantity of sorrel is used with the cochineal bath; and the subsequent tanning is given with galls, instead of sumach, which renders the colour as durable as the leather itself. The roughness always observed on the surface of the skin, is given by a heavy kind of iron rake, with blunt points. The yellow *saffians*, are dyed with the berries of a species of *rhamnus*, (the Avignon-berry would answer the same purpose, and is used in other countries,) or with the flowers of the wild chamomile.

The singular and valuable leather, called *shagreen*, is a manufacture almost peculiar to Astracan, where it is prepared by the Tartars and Armenians. For making shagreen, only horses, or asses, hides are taken, and it is only a small part from the crupper along the back that can be used for this purpose. This is cut off immediately above the tail, in a semicircular form, about 34 inches upon the crupper, and 28 along the back. These pieces are first soaked in water, till the hair is loose, and is scraped off; and the skin again soaked, is scraped or shaved so thin as not to exceed a wetted hog's-bladder in thickness, and till all the extraneous matter is got off, and only a clean membranous pelt remains. The piece is then stretched tight on a frame, and kept occasionally wetted, that no part might shrink unequally. The frames are then laid on a floor, with the flesh sides of the skins undermost, and the grain sides are strewed over with the smooth black hard seeds of the *alabuta* or *goose-foot*, (*chenopodium album*,) and a felt is then laid upon them, and the seeds trodden in deeply, into the soft moist skin. The use of this is, to give the peculiar mottled or roughened surface, for which shagreen is distin-

guished. The frames, with the seeds still sticking to the skins, are then dried slowly in the shade, till the seeds will shake off without any violence; and the skin is left a hard horny substance, with the grain side deeply indented. It is then laid on a solid block, covered with wool, and strongly rasped with two or three iron instruments, (the particular forms of which need not be here described,) till the whole of the grain side is shaved, so that the impressions of the seeds are very slight and uniform. The skins are then softened, first with water, and then with a warm alkaline lye, and are heaped, warm and wet, on each other; by which means, *the parts indented by the impression, regain much of their elasticity; and having lost none of their substance by paring, rise up fully to the level of the shaved places*, and thus form *the prominent grains*, or the granular texture, peculiar to the shagreen. The skin is then salted and dyed.

The beautiful green dye is given, by soaking the inner or flesh side of the skin, with a saturated solution of sal-ammoniac, strewing it over with copper filings, rolling it up with the flesh side inwards, and pressing each skin with a considerable weight, for about twenty-four hours, in which time, the sal-ammoniac dissolves enough of the copper to penetrate the skin with an agreeable sea-green colour. This is repeated a second time, to give the colour more body.

Blue shagreen is dyed with indigo, dissolved in an impure soda, by means of lime and honey. *Black shagreen* is dyed with galls and vitriol. The skins are finished with oil, or suet.

On various Preparations of Carmine.

(Continued from p. 302.)

CHINESE CARMINE.

Twenty ounces of very finely-powdered cochineal are boiled with a pailful of river water, contained in a proper vessel; to which sixty grains of Roman alum are added. After seven minutes' ebullition, the boiler is removed from the fire, and the liquor put into another vessel, by means of a siphon: it may also be passed through fine linen. This liquor is to be preserved for use. A solution of tin is previously prepared, in the following manner. Ten ounces and a half of common salt (muriate of soda) are dissolved in a pound of aqua-fortis (nitric acid:) to this solution, when cold, four ounces of Malacca-tin filings are added, by degrees:—a fresh quantity of tin must not be put in till the former is dissolved. This solution is added, drop by drop, to the heated cochineal liquid; and the carmine precipitates. When the carmine is deposited, the liquid is decanted; and the carmine allowed to dry in the shade, in china or Delft-ware vessels.

THE GERMAN METHOD OF PREPARING CARMINE.

Six pints of river water are boiled in a copper vessel: two ounces of powdered cochineal are then thrown into it, and well stirred. After six minutes' boiling, sixty grains of powdered alum are thrown

in, and the whole suffered to boil for three minutes. The vessel is then removed from the fire; and the liquor drawn off with a siphon, and filtered through a lawn sieve. The liquor is then placed in many china or Delft-ware vessels, and allowed to remain at rest for three days; when it is decanted, and the deposits dried in the shade. After three more days the liquor is again to be decanted; when it will have formed carmine of an inferior quality.

ALYON'S PROCESS.

Two pailsful and a half of river water being boiled in a copper vessel, a pound of ground cochineal is put into it by degrees, and the liquor is well stirred with a brush. After having boiled about half an hour, a weak alkaline ley is added, prepared with five drachms of soda, dissolved in a pint of water: this is poured into the decoction of cochineal; and, after half an hour's boiling, the vessel is removed from the fire, and set, in an inclined position upon a table. Six drachms of alum are then added, and well stirred into it; and the whole is afterwards left at rest for twenty-five minutes. The liquor, which is then become of a very fine scarlet colour, is to be decanted into another vessel; and the whites of two eggs, previously beaten up with half a pound of water, are added: the whole is then stirred up with the brush; and the vessel replaced upon the fire, and made to boil. The whites of eggs coagulate, and precipitate with the colouring substance, which forms the carmine. The boiler is then removed from the fire, and left at rest for twenty-five or thirty minutes, in order that the carmine may entirely deposit itself. The liquor is decanted; and the deposit placed upon fine linen, that it may drain. The carmine is afterwards removed with silver or ivory spoons, and dried upon plates which are covered with white paper. A pound of cochineal, by this process, affords an ounce of carmine.

It is essential that *soft water only* be employed.

We see, by two of these recipes, that alum is not, as many authors have advanced, an indispensable material, in the preparation of carmine: in one instance, it is replaced by the acid oxalate of potash; in another, by the hydrochlorate of tin: and the experiments of MM. Pelletier and Caventou prove that these salts, as well as the alum, serve, both to heighten the colour, and to assist in its precipitation, by the action of their excess of acid on the animal matter contained in the cochineal.

Carmine is very much used in miniature-painting: and a great quantity of it is also employed in the manufacture of artificial flowers. The confectioners and apothecaries make use of it, to colour various preparations; and it gives a beautiful tint, when mixed with any substances which they wish to colour. When it is used as a liquid colour, it is dissolved in the volatile alkali: the excess of alkali is dissipated by spontaneous evaporation; and, when the solution is become inodorous, it is fit for use.

MM. Pelletier and Caventou have given the name of Carmine to the pure colouring-matter contained in the cochineal, which is the basis of the carmine. These chemists have succeeded in separating it, by first macerating the cochineal in ether, in order to free it from

a greasy substance which it contains, and then repeatedly treating the cochineal with boiling alcohol. At each decoction, it deposits, on cooling, a granulated matter, of a beautiful red colour; and, on leaving the solutions to a spontaneous evaporation, the deposit continues to form, and then assumes a crystalline appearance. In this state, the colouring-matter of the cochineal is nearly pure; nevertheless, it still retains a little of the greasy substance; to divest it of which, entirely, MM. Pelletier and Caventou direct it to be re-dissolved in alcohol at 40°, and then to add to it an equal part of ether. This mixture is at first very thick, but afterwards becomes clear; and, in a few days, the sides of the vessel are found to be covered with an incrustation of a brilliant reddish-purple colour, which is *pure carmine*. This has been characterized by the following properties: its colour is a vivid purple; it has a crystallized appearance; is perfectly unalterable in the air; heat easily decomposes it, and without producing any azote; it is very soluble in water; and neither crystallizes by evaporation or cooling; it is insoluble in ether; soluble in boiling alcohol, &c.

Description of a Process for making Damasked Steel. By M. Breant.*

It appeared from M. Breant's former experiments, published in the "Bulletin de la Societé d'Encouragement," for 1821, that the watered or wavy appearance on the eastern damasked steel is not mechanically produced, but the result of a particular composition, and he has at length ascertained that it is owing to an increased quantity of carbon incorporated with the steel beyond the proportion contained in the common sorts. According to this chemist, the effect depends on two states of combination in which the carbon exists in the steel, and numerous experiments have enabled him to give the rules for several processes for the manufacture of different kinds of cast steel.

"The watered (*moirée*) surface of the oriental sabres has led to the supposition that they are made from what is called *stuff* (*etofe*,) that is, a bundle of steel bars, or wires, forged and welded together, and twisted in different directions.

"A long series of experiments has taught me that the substance of the oriental damask is a fused steel, more loaded with carbon than our European steels, and in which, by means of a proper management in the cooling, a crystallization of two distinct compounds of iron and carbon is effected.

"This separation is the essential condition; for if the fused matter be suddenly cooled, as is the case when cast into small ingots, no appearance of damask is perceptible; it is only to be discovered by using a magnifying lens.

"Iron and carbon form at least three distinct compounds; steel,

* From the *Annales des Mines*.

which is at one of the extremities of the series, contains but a very small proportion (1-100th) of carbon; plumbago, on the contrary, contains from 12 to 15 times more carbon than iron. Black and white cast iron hold the middle place."

As bodies combine chemically only in definite proportions, if in making steel there be a deficiency of carbon, a portion of the iron will remain merely in a state of mixture with the steel that is formed, the quantity of the latter depending on the quantity of combined carbon; and on cooling the mass slowly, the more fusible particles of steel will have a tendency to unite together, and separate from the iron. This alloy, therefore, will show a damasked surface, but it will be white, ill defined, and the metal being mixed with iron will not be capable of much hardness.

The exact proportion of carbon requisite to convert all the iron into steel will give a homogeneous mass; and consequently no separation of distinct compounds can take place on cooling. "But, if the carbon be in slight excess, the whole of the iron will first be converted into steel; then the free carbon which remains in the crucible will combine in a new proportion with a part of the fused steel already formed, and there will thus be two distinct compounds, pure steel, and carburetted or cast steel. These two compounds, at first indiscriminately mingled together, will tend to separate as soon as the liquid matter is at rest, and crystallization will ensue, during which the molecules of the two compounds will arrange themselves according to their respective affinities and weights.

"If we dip a blade, made of steel thus prepared, in acidulated water, a very evident damask will be developed, in which the portions of pure steel will be black, and those of the carburetted will remain white, because the acidulated water does not so readily lay bare the carbon of the carburetted steel as of the pure.

"It is, therefore, to the irregular division of the carbon by the metal, and the formation of two distinct compounds, that the production of the damasked surface is to be attributed, and it is obvious, that the more gradually the mass is cooled, the larger will be the veins of the damask. It is, perhaps, for this reason, that we should avoid fusing the substance in too great a mass, or at least that some limit should be observed in the process; in support of which opinion I may quote Tavernier, who has given in his "Voyage en Perse" some information as to the size of the balls of steel, which, in his day, were used in making the damasked blades.

"The steel capable of being damasked, comes, says he, from the kingdom of Golconda; it occurs in commerce in masses of the size of a halfpenny loaf; they are cut in two to see if they be of good quality, and each half makes one sword blade.

"From this account it is evident, that this Golconda steel was in buttons like *wootz*, and that each button could not have weighed more than five or six pounds.

"Tavernier adds, that, if this steel were tempered by the European processes, it would be as brittle as glass. Hence, as Reaumur observed, it must be very difficult to forge.

"That Philosopher having received some specimens of Indian steel from Cairo, found no one in Paris who could forge it; whereupon he laid the blame on our workmen; since the inhabitants of the east know how to work that kind of steel. I will explain, presently, the proper method of proceeding to ensure success.

"As carbon has the chief influence, not only in producing the damask on steel, but also on its intrinsic qualities, I fear that Messrs. Stodart and Faraday were led into error in their experiments (as I, for a long time, was myself,) and attributed effects to metallic alloys which were owing more particularly to an increased proportion of carbon.

"I am very far from disputing the existence of metallic alloys in the oriental sabres, although, in the few fragments which I have had an opportunity of examining, I have not found either silver, gold, palladium, or rhodium; I think it very probable, however, that different combinations may have been attempted. A people who knew how to harden copper by alloying it with other metals, are very likely, from analogy, to have tried the same process with iron.

"This view of the subject led me to form various metallic alloys, some of which gave satisfactory results. One of the sword blades, which I presented to the Exhibition, contains one-half per cent. of platina, and a larger proportion of carbon than common steel; its damask is owing particularly to the latter. Excellent razors have been made with this alloy.

"At all events, these alloys should not be tried till we have fully ascertained the effects of pure carbon, and we ought to begin by combinations in very small proportions. The addition of a metal makes the steel more brittle; however, I have obtained ductile alloys, in raising the quantity of gold and platina, as high as 4 per cent., and that of copper and zinc to 2.

"As to zinc, certain precautions are necessary in forming alloys with that metal; it occasions violent detonations, wherefore it must be added to the fused metals in very small portions at a time. In forging steel alloyed with zinc, part of the metal is volatilized and dissipated.

"Manganese unites readily with steel, and the alloy forges easily; but it is very brittle when cold: I have made gravers with this alloy which cut iron without having been tempered: the damask of this mixture is very black and well defined.

"Plumbago appeared in some instances to soften steel which had been rendered too brittle by an excess of carbon; at least I have obtained excellent results with 100 parts of steel, 1 of lamp-black, and 1 of plumbago.

"But a very remarkable experiment, from the advantage that may result from it in working on a large scale, is one which showed that 100 parts of soft iron and 2 of lamp-black fuse as readily as common steel. Probably the whole of the carbon does not combine. Some of our best blades are produced from this combination. It has the disadvantage of contracting very much on cooling, and the buttons generally have cavities which make them very difficult to forge; but

if, instead of damasked, we only want to make common steel, the contraction on cooling may be prevented by casting this compound in an ingot mould.

"This experiment teaches us that the previous cementation of the iron is not necessary in order to obtain very good steel. It may be treated at once with lamp-black, which will very much lessen the expense of the manufacture.

"One hundred parts of very gray cast iron filings, and 100 parts of the same filings previously oxidated, gave a steel of a fine damask, and calculated for sword blades, &c. It is remarkable for its elasticity, an important quality in which the Indian steel is deficient. I have always operated on three or four pounds at a time. The larger the proportion of the oxidated ingredient, the tougher (*nerveux*) is the steel. The oxygen combining with the metals of the earths, and part of the carbon, it is obvious that the more oxide there is, the more ductile will be the result; but it will also be softer. The blackest cast iron answers best. I am convinced that with that substance we may make cast steel in reverberatory furnaces on a very large scale, by adopting a process analogous to that used in refining bell metal, namely, by adding to the fused metal a portion of the same metal oxidated; or, still better, native oxide of iron.

"It seems to me to be equally practicable to convert the whole of the product of the Catalonian forges (*forges à la Catalane*) into cast steel, by altering the construction of the furnaces so as completely to fuse the metal. I think, if I had the direction of one of those forges, I could find means to manufacture steel of the most desirable quality with great saving of expense.

"I have always been careful to stir the fused metal thoroughly before I suffered it to cool; this is indispensable in making metallic alloys, for without it the damask is not homogeneous.

"It was after I had attempted to combine steel with aluminum and silicium, that I observed the influence of carbon in producing the damask: from that time I always used the carbon of lamp-black.

"If some earths be found on analyzing my cast steel, they must probably be attributed to the cast iron employed, or to the iron, the plumbago, or the crucibles.

"The more carbon a steel contains, the more difficult it is to forge. The greater number of those that I have prepared can be tilted at only very limited temperatures. At a white heat they crumble under the hammer; at a cherry-red they become hard and brittle, and this quality increases in proportion as the temperature diminishes; so that when once it has fallen below cherry-red, if we endeavour to cut it with the graver, or the file, we find it much harder and more brittle than after it is completely cold.

"It is evident that the Indian steel, which most of our workmen are unable to forge, is similarly circumstanced; and if the Indians work it without difficulty, it is because they know the limits of temperature within which it is manageable.

"I am convinced from experience that the orbicular veins, which the workmen call brambles (*ronce*,) and which are seen on the beau-

tiful Indian blades, are the consequence of the way in which they are forged. If steel be drawn out lengthwise, the veins will be longitudinal; if it be equally extended in all directions, the damask will have a crystalline appearance; if it be rendered wavy in both directions, it will be shaded like the eastern damask. But few trials are necessary to produce any sort of watering that may be desired.

"The best process for developing the damask, so that the steel may become black or bluish, without losing its polish, is, in my opinion, that which is employed in the East. It is described, by M. le Vicompte Héricart de Thury, in a report inserted in the 'Bulletin de la Société d'Encouragement,' No. 220, for December, 1821, twentieth year, p. 361."

On the Use of Animal Charcoal, as a Flux.

TO THE EDITORS OF THE ANNALS OF PHILOSOPHY.

Gentlemen—The great power of wood charcoal as a flux for minerals and metallic ores has been long known, and extensively taken advantage of in the arts and operations of chemistry, but I am not aware that any application of *animal* charcoal to the same purposes has hitherto been attempted. The following facts, however, it is thought, furnish sufficient grounds for believing that the latter might prove an advantageous substitute for the former, in those cases where its comparative expense would admit of its employment; and they may, therefore, perhaps, obtain a corner in the *Annals of Philosophy*, if not occupied with more important matter.

Being in the habit of using animal charcoal as a dentrifice, I nearly filled a brass crucible of moderate size, and about four-tenths of an inch in thickness, with ivory-black, for the purpose of purifying it by re-ignition. The crucible was closed with a cast iron cover, which had a small perforation in it as a vent for the gas which was extricated; and in this state was set in the fire-place of an air furnace, which was commonly employed for heating alkaline lixivia. The fire was not very large, though thoroughly inflamed, and the grate door was left wide open. The crucible soon acquired a red heat (to which it had, prior to this, been frequently exposed,) and the gas burned steadily at the aperture in the cover. Being obliged to leave it at this period, on my return in about ten minutes, I was a little surprised to find the iron cover of the crucible lying by itself, and no vestige of the latter apparent in the fire-place. On examining the ash-pit, several rugged pieces of brass were found, and two large masses of cinders, firmly compacted together by an upper coating of oxidized brass. In one of these a large stick of the metal was imbedded, which broke with a rough coppery appearance, but on filing immediately displayed its brassy nature.

As the heat by which this was affected appeared to me much inferior to that which brass generally requires for its fusion, I exposed some brass wire, about one-tenth of an inch in diameter, by itself in the same fire, and closed the door. After remaining there nearly half

an hour, it was taken out broken into two parts. It was become oxidized, and, as it were, wormeaten on its surface, and was rendered very brittle in its fracture, but it had not the least appearance of any loss by fusion.

Endeavouring again to effect my purpose with the ivory-black, I exposed some of it in a *cast iron* crucible, in the same fire-place, and the door open as before. This crucible was only three-tenths of an inch thick, and had occasionally been exposed for short periods to the greatest heat of this fire-place; not expecting, therefore, that it would receive any injury in the present instance, I left it unnoticed for about 20 minutes, by which time the ivory-black had ceased to emit any more gas. It was then taken out, but unfortunately not in the condition in which it was introduced. Nearly half the circumference of the crucible for one and a half inch upwards, and a large part of its bottom, had run into a complete slag upon the opposite side, which happened to have fallen lowest in the fire, and the ivory-black was almost consumed, from the access which the air thus acquired to the inside of the crucible. The cover and upper parts of it had suffered no injury.

From the great heat which brass and particularly cast-iron require for their fusion, and the low degree of it employed in these cases, little doubt can be entertained of the superior agency of animal charcoal as a flux. Both the crucibles it must also be noticed had been formerly used for the very purpose of procuring charcoal from wood in a common grate, when it is conceived the heat was little inferior to that in the present instance, and the chances of their fusion then otherwise equal. It might, therefore, be worth the trouble for those whom it may concern, to make one or two comparative experiments on this subject, with greater accuracy than the preceding, in order to determine it decisively. F.

Is it not probable that in the experiments above detailed, the metals were converted into phosphurets by the decomposition of the phosphoric acid? and if so, the increased fusibility would probably be derived from this circumstance.—*Editor of Annals of Philosophy.*

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*On the Manufacture of Ceruse, Krems-White, or White-lead; and, particularly, of the celebrated Ceruse of France.**

Ceruse, or *White-lead*, is the *sub-carbonate of lead* of the Chemists.† This preparation is chiefly used in painting wood, or other articles, white. As it easily mixes with oil, and preserves its colour well, it is spread with facility by the brush, and affords a good body of colour, on whatever substance it is applied. It is either employed alone, as a colouring matter, or mixed with other colours, as well to brighten

* From the *Dictionnaire Technologique.*

† The common *ceruse* is frequently adulterated by the admixture of foreign matters; such as lime, sulphate of barytes, &c.; but *pure ceruse* will not admit of any of these mixtures, without detection.

them as to give them body. Ceruse is manufactured in various ways, in different countries. England and Holland, for a long time furnished commerce with this article; but establishments for the manufacture of it have been singularly multiplied within a few years; and there now exist a great number of them, in Germany, in the Netherlands, and in France. Marcel de Serres has given us an exact description of the process followed in Germany; and we cannot do better, than to copy it literally, for the information of our readers. We shall afterwards point out the different modifications of the process, as used in other countries, particularly the new process adopted in France; and terminate the article by giving some general observations on Ceruse.

Krems-white has been so named, from the place where the first preparations of this colour were made: but, for some years past, the manufactories, which formerly existed there, have ceased working; and the finest manufactory of this article is situated at Klagenfurt, in Carinthia. This manufactory belongs to Baron Herbert: it is much more considerable than that at Feldmuhl, which belongs to Baron Leykam; or even than that at Vienna.

The town of *Krems* being much less known to the chemists and mineralogists than *Kremnitz* in Lower Hungary, they have often, by mistake, termed this preparation *Kremnitz-white*, although it has never been manufactured at all in the latter place.

In order to give an exact idea of the method used by the Germans in preparing *Krems-white*, we will describe the various operations used in their processes.

First Operation.

The lead used in all the manufactories of *Krems-white* is brought from Bleiberg, near Willach, in Carinthia. This lead is very pure, and does not apear to contain any oxide of iron,—a quality most essential to the beauty of the white. It is easy to judge of the advantages which the manufacture of Klagenfurt possesses over all the others, in having this pure lead so near at hand. The lead is melted in the common melting-pots; and then formed into leaves of various thicknesses, according to the manufactories. In order to make these leaves, the fused lead is poured upon a plate of cast-iron, with raised edges, placed above the pot; and as soon as the surface of the metal begins to consolidate, the iron plate is a little inclined: the lead which remains fluid then falls back into the melting-pot; and that which has set, or becomes solid, remains, and is raised up like a sheet of paper. The workmen, being careful to cool the plate from time to time, with water, may easily cast many quintals of lead in a day. The leaves of lead vary both in size and thickness. In some manufactories, they are half-a-line* thick; and in others, scarcely a quarter. In certain manufactories, one of these leaves will entirely fill the box used in

* A line is the twelfth part of a French inch, and rather exceeds the tenth part of an English inch; eleven English tenths of inches being nearly equal to the French inch.

the succeeding process; whilst, in others, four will be required for that purpose. It is essential that the surfaces of the leaves should not be smooth; for it is evident, that a rough surface is easily attacked by acid vapours, whilst an even one presents fewer points of contact.

Second Operation.

The formation of the leaves being thus accomplished, they must then be so disposed as to be easily attacked by the acids: for this purpose, they bend the leaves, and suspend them over pieces of square wood, the width of the boxes in which they are to be placed: these leaves, thus suspended by the middle, resemble the leaves of a book; and are placed, with the pieces of wood supporting them, in wooden boxes. The size of these boxes is nearly the same in all the manufactories: their length is about four and a half or five feet; their width from a foot to a foot and two inches; and their depth from nine to eleven inches. These boxes are made very strong: they are always careful to secure them by mortises; and to observe that the nails, with which they are fastened, do not project through the sides of the wood. They never totally close these boxes, with the leaves of lead in them; but cover their bottoms with a coating of pitch, about an inch thick. These boxes are, however, luted with paper, in those manufactories where the stoves are heated by smoke; for we well know how hurtful the vapours of sulphuretted and phosphuretted hydrogen gas are to white colours, and how quickly they attack the oxides of lead. In Carinthia, they formerly used, as well as in Holland, to form the leaves of lead into coils, and place them, thus coiled up, in the boxes: but this method does not appear to be advantageous; because it is evident that these coils present less surface to the action of the acid vapours, and they often fall into the liquid at the bottom of the boxes; which ought to be carefully avoided, because the carbonate of lead then formed is never white. The leaves, thus bent, and suspended on the pieces of wood, are placed in the boxes, so as to be at the distance of about two and a half inches from the bottom. They are very careful that the leaves of lead do not touch each other, nor the wood of the boxes: for if they were to touch, the vapours could not so easily corrode them; and if they touched the wood, the carbonate of lead would be discoloured, and its whiteness injured. Previous to placing the leaves of lead in the boxes, they put in a mixture; which is not, however, the same in all the various manufactories: the proportions of this mixture being, in some, equal parts of vinegar and the lees of wine; whilst, in others, they use a mixture of twenty pounds of lees of wine, eight pounds and a half of vinegar, and one pound of carbonate of potash. It is evident, that, in those manufactories where carbonate of potash is not used, nor smoke employed to heat the boxes, it is not requisite to lute them; and that in those, on the contrary, where carbonate of potash and smoke are used, there is the greatest necessity for so doing: so that, in different manufactories, things which are the most opposite are recommended, and for very obvious reasons.

Third Operation.

The mixture being poured into the boxes, and the leaves of lead deposited in them, they place the boxes in a particular kind of stove; in which, by means of heat, the vapour of the mixture which was put into the boxes, in rising, corrodes the leaves of lead, and forms a carbonate. The stove is usually heated by two furnaces; seldom contains more than ninety boxes; and has only one opening, which is used as a door. Although it is not very important to give the exact size of these stoves, nevertheless, as faithful narrators, we should mention, that the one measured was nine feet high, four toises wide,* and five toises long.

The heat must never be raised above thirty degrees,† and is generally continued about a fortnight; at the end of which time the operation is terminated. If the heat be too strong, and the vapours too thick, a great part of the carbonic acid escapes: and the lead being less attacked by these vapours, the produce of carbonate of lead is much less considerable.

When the operation has been well conducted, an equal quantity of carbonate of lead, by weight, will be obtained, as of the lead which had been employed: thus, if three hundred pounds of lead be put into the boxes, the same quantity of carbonate of lead will be formed; as, when the crust of carbonate of lead is completely collected, a small quantity of lead will be found, which must be fused afresh, to form new leaves. The mixture, which is put into the boxes to form the carbonate of lead, will only serve once: and when, as in many manufactories, potash enters into the mixture, the residuum is sold to the hatters.

Fourth Operation.

When it is presumed that the preceding operation is terminated, and that the leaves of lead have been properly corroded, they are removed from the boxes: they will then have become a quarter of an inch in thickness, or even more; whereas, in the first instance, they did not exceed the thickness of a quarter of a line. Rather large-sized crystals of acetate of lead are frequently observed on the edges of these leaves.

When the leaves of lead are removed from the boxes, they must be well beaten, in order that the crust of carbonate of lead, which is formed on their surfaces, may be removed. The carbonate of lead, thus obtained, is then put into large vats; where it is purified, by means of washing-over. Whenever it happens that there are any small pieces of lead found remaining in the boxes, they are washed in water in order to dissolve and separate the acetate of lead which may adhere to them.

The manner of washing over the carbonate of lead is very simple, and resembles a great number of other processes of this kind. For washing over the carbonate of lead, they use a large wooden vat, generally of a square form, and divided into seven or nine compart-

* The toise is equal to 76,734 English inches.

† Or 86° of Fahrenheit.

ments, which are all equal in size; but the partitions between them vary in height; so that, when the first or highest compartment is full, the water flows into the second, and so on. The water which flows into the first compartment passes successively into the others; and the workmen being careful to keep it always in motion, it successively deposits the ceruse which it carries along with it; the precipitates of white lead, which are found in the furthest compartments, being successively, the finest and lightest. When the white lead has been thus washed over, it is deposited in other large vats; where it receives a second washing, and in which it is kept constantly under water. It is necessary to observe, that when the carbonate of lead is washed with water, a white scum always rises, and floats on the surface; this appears to be a kind of acetate of lead. In order to precipitate the small quantity of carbonate of lead found in solution, a little potash is added, and the carbonate instantly precipitates. This phænomenon, however, merits a more accurate observation. The carbonate of lead, purified by the washings to which it has been subjected, and remaining in the vats, would always preserve the consistence of a liquid paste: but, for convenience in commerce, it is always removed from the vats with wooden spatulas, and placed upon the drying stages. When it comes in contact with the air, it very soon acquires the consistency of a soft paste; in which state it is put into moulds, in order that it may assume the form in which it is generally found in commerce.

All the carbonates of lead sold in commerce are nearly of the same quality; provided that no other substances are added to them; and, more particularly, if those which appear of the finest white, and are the most pure be not separated from them. The varieties of carbonates of lead, bearing different names, are thus regulated.

First quality.—The carbonate of lead found in the last, or lowest department, is the finest. When carefully prepared, this is designated, in Germany, by the name of *Kremserweiss*, or *Krems-white:* it is likewise known by the name of *silver-white.* It is used by the apothecaries, and artists, for the most delicate purposes. Sometimes, however, a carbonate of lead, which remains floating a considerable time, is still whiter. This *Krems-white*, of the first quality, is entirely pure; and it is never mixed with sulphate of barytes, like those of inferior qualities; so that it may be regarded as a pure carbonate of lead.

Second quality.—This second sort is formed by mixing equal parts of sulphate of barytes with carbonate of lead: it is known, in Germany, by the name of *Venerianerweiss, Venice-white.*

The sulphate of barytes used in Germany, in the manufactories of carbonate of lead, is generally brought from the Tyrol; because, perhaps, it does not contain oxide of iron; but sometimes they obtain it from Styria. The ferruginous oxide, which may be contained in sulphate of barytes, is very prejudicial to the beauty of the white colour, so much desired; and especially when the sulphate is calcined, which is done for the purpose of pulverizing it the more readily: and the calcination particularly discolours that from Styria, on account of the

oxide of iron which it contains; whilst that from the Tyrol still remains white. In some manufactories, however, where they have perceived this inconvenience, they now cease to calcine the sulphate of barytes.

Third quality.—This third sort is formed by mixing two parts of sulphate of barytes with one of carbonate of lead: it is known in Germany by the name of *Hollanderweiss*, *Dutch-white*.

These various kinds of white are generally made according to the proportions we have described: however, for the manufacture of a very cheap article, they mix seven parts of sulphate of barytes with one of carbonate of lead: this white, nevertheless, always bears the name of *Dutch-white*, but is rejected for delicate painting. It is convenient that white lead should sometimes be mixed with sulphate of barytes; and for this simple reason, that it gives it more opacity; a convenience, however, which can only exist in the painting of the less-delicate pictures: as in the most-delicate paintings, its transparency is rather an advantage than otherwise.

(TO BE CONTINUED.)

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*On extracting the Colouring Matter from the Carthamus.**

Carthamus, or Bastard Saffron, (*safranum*, *carthamus tinctorius*,) a plant of the *syngenesia polyg. æqualis* of Linn., the *flosculosi* of Tournefort, and the *cinarocephalæ* of Jussieu, is an annual; grows spontaneously in Egypt, of which it is a native; and is cultivated in India, and some parts of Europe, on account of its valuable properties for dying. It has a straight, firm, smooth, and whitish stem, two or three feet high; which is divided towards the top into many branches, furnished with leaves that are simple, entire, oval, pointed, and bordered with prickly teeth; each branch being terminated by a somewhat large flower, in which the scales of the calix are spinous, the florets hermaphrodite, and the corols, which have five segments, of a beautiful red-saffron colour.

The corol of the *safranum* is usually gathered as soon as the flower begins to open, because it loses its lustre when it is more fully blown. It must be dried in the shade, and preserved from any damp or moisture. It is the more valuable, in proportion to the brightness of its tint. When it has a dusky hue, it is a certain proof that it has either been gathered in a rainy season, or badly dried, and that its colouring matter is greatly deteriorated.

The corol, which is also called the flower of the carthamus, and commonly *safflower*, is very much used in dying. It contains two colouring matters; one of a reddish yellow, which is rejected as useless, because it produces only inferior shades; the other, which is of a beautiful red, serves to produce every shade, from the most delicate rose to the deepest cherry-red. The first easily dissolves in cold water; whilst the second, which is of a resinous quality, does not possess the same property. In order to separate the one from the

* From the *Dictionnaire Technologique*.

other, it is sufficient to wash the carthamus under a small jet or stream of water, which removes the yellow colouring matter. When the water becomes colourless, the washing may cease, and the carthamus be macerated in a weak solution of soda: the bath soon becomes coloured of a darkish yellow red. When it is thought that the maceration has been sufficiently prolonged, it is passed through a sieve or filter; then carded cotton is plunged into it, and a vegetable acid is added, until the alkali is completely saturated. Lemon-juice is generally preferred, because it renders the colour more vivid. The carbonic acid which is disengaged during the saturation produces a slight effervescence, which requires attention, lest the liquor should flow over the edges of the vessel: it must be continually stirred, and the acid be added by degrees. The colouring matter, which was only held in solution by the alkali, separates from the solution as the saturation is effected; but, instead of being deposited on the sides of the vessel, it fixes itself, in preference, on the cotton, with which it has an affinity. The first washing of the carthamus can never sufficiently clear it of the yellow-colouring matter; a portion of it is always found in the alkaline solution, and rather injures the tint of the cotton which has served to collect it; but this is removed with facility by further washings. When the cotton has been well washed, it is again treated with a fresh solution of carbonate of soda; and a bath is obtained, containing only the red-colouring matter, perfectly pure. When it is used for dying, the stuffs are plunged into it; and, as in the former case, a sufficient quantity of lemon-juice, or tartaric acid, is added. If it is wished to separate the colouring matter as it is employed in making bunches of artificial roses, the manipulation is exactly the same; with this difference only, that the vessel does not contain any cotton on which the colouring matter might fix, and it therefore deposits itself by degrees in very minute particles: the liquor is then decanted, the precipitate is washed, and distributed into several saucers; and assumes, on drying, a kind of greenish-coppery tint, affording, by reflected light, an appearance somewhat like that of cantharides.* The rose-coloured tint is developed as soon as water is added to it. This colouring matter, mixed with the chalk of Briancon† reduced to an impalpable powder, constitutes the *vegetable rouge* or paint. R.

On Artificial Stone Chimney-pieces. By Mr. Charles Wilson.

From the Transactions of the Society of Arts, &c.

Take two bushels of sharp drift-sand, and one bushel of sifted slaked quick-lime; mix them together with as little water as possible, and beat them well up together for half an hour every morning, for three or four successive days; but never wet them again after their first mixture.

* These saucers are sold in this country, in the colour shops; and are known by the name of *pink-saucers*.

† In England, steatite, or French chalk, reduced to fine powder, by means of Dutch rushes, is employed for this purpose.

To two gallons of water, contained in a proper vessel, add one pint of single size, made warm; a quarter of a pound of alum, in powder, is then to be dissolved in warm water, and mixed with the above liquor.

Take about a shovel full of the first composition, make a hole in the middle of it, and put therein three-quarters of a pint of the mixture of alum and size, to which add three or four pounds of coarse plaister of Paris; the whole is then to be well beaten and mixed together rather stiff; put this mixture into the wooden moulds of your intended chimney-pieces, the sides, ends, and tops of which moulds are to be made of moveable pieces; and they must be previously oiled with the following mixture:

Take one pint of the droppings of sweet-oil,* which costs about one shilling the pint; and add thereto one pint of clear lime-water, made by pouring boiling water on lumps of chalk-lime in a close vessel, till fully saturated: when the lime-water becomes clear, it is fit to be added to the oil, as above-mentioned; and on their being stirred together they will form a thick oily mixture, or emulsion proper to apply to the moulds. In forming the side or jamb of a chimney-piece, the mould is to be first half-filled with the sand, lime, and plaister composition; then two wires, wrapped round with a thin layer of hemp or tow, and which wires are nearly the length of the piece to be moulded, are to be placed in parallel lines lengthways, in the mixture or composition in the mould; and afterwards the mould is to be filled up with more of the composition; and if there be any superfluous quantity, it is to be struck off with a piece of flat board.

The lid or top part of the mould is then to be placed upon it, and the whole must be subjected to a strong pressure, either from weighted levers or a screw-press. The composition is to remain under this pressure for twenty or thirty minutes; the precise time necessary, may be known by examining a small specimen of the composition, reserved purposely to determine the time it requires to harden and set firm in.

The sides of the moulds are to be held together by iron clamps and wedges.

The wires above mentioned answer the double purpose of giving strength to the jambs, and of retaining the whole mass together, in case it should at any time be cracked by accident.

The chimney-pieces may be made either plain or fluted, according to the mould; and when moulded, they are finished off by rubbing them over with alum-water, and smoothing them with a trowel, and a little wet plaister of Paris.

A common plain chimney-piece of this composition, is sold at only seven shillings (*sterling;*) and a reeded one at twenty-eight shillings, completely fitted up.

* The droppings of sweet oil is an impure, or rancid olive oil, unfit for the table. Any other oil will answer the purpose.—EDITOR.

On a Wholesome Glaze, for Common Red Earthenware; and on an improved Common Earthenware. *By* MR. J. MEIGH, *of Shelton, Staffordshire.*

From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.

The common coarse red earthenware is made of brick clay, hence it is very porous: it is also baked at as low a heat as possible, partly in order to save the expense of fuel, and partly, being made of common clay, which varies considerably in its fusibility, it will not always bear a high firing, without losing its shape, and becoming unsaleable.

For the reasons above mentioned, it is necessary to employ a glaze, fusible, cheap, and capable of filling up the pores of the ware, so as to enable it to hold fluids in ordinary use, either as articles of food or of domestic employment. Litharge, and the common potter's lead-ore, are the articles usually employed; the one for the transparent, the other for the black opaque glaze. The objections, however, to a glaze, wholly or in part composed of lead, are, first, that it cracks when raised rapidly to the temperature of boiling water, on account of the different ratio of expansibility between the glaze and the clay, and then admits the liquor into the body of the ware: secondly, the glass of lead by itself, or even when mixed in small proportion with earthy substances, is very soluble in vinegar, in the acid juices of the common fruits, and in animal fat, when boiling. When such substances, therefore, are cooked in vessels of common red earthenware, a quantity of salt of lead is formed, which, mixing with the food, produces violent colics, and all the serious, and often fatal effects, that attend the internal administration of the salts of lead.

The discovery of a better and more wholesome glaze, sufficiently cheap to be applied to the common red ware, appeared to the Society to be an important desideratum; and, in their opinion, this is now effectually supplied, by the discovery about to be detailed.

The rock called red marl is usually in the form of beds, of a soft, coarse, slaty structure, and red colour, forming the chief part of the common soil, in many extensive districts in this island, to the N. and W. of a line running obliquely from Durham to Exeter. This marl is easily ground in water to an impalpable powder, which remains suspended for a considerable time in the fluid. A mixture of this kind is prepared; and the ware previously well dried, but not burnt, is immersed in it. The superficial pores of the clay are thus filled with fine particles of the marl; and a fit surface is prepared, on which to lay the glazing. Being again carefully dried, the ware is ready for the glaze, which is thus composed:

Take 1 part Cornish granite, consisting chiefly of felspar,
1 part glass,
1 part manganese;

the whole well ground together, and diffused in water, to the consistence of cream. Dip the ware in this mixture; and, when thoroughly dry, place it in the kiln, and fire it in the usual way. The result

will be a solid black glaze, very permanent, and not containing any ingredients noxious to health. If an opaque white glaze is required, omit the manganese.

Mr. Meigh has also employed common marl, and the red marl, as ingredients of the body of the ware, with excellent effect; without increasing its expense. He uses for this purpose,

4 parts of common marl,
1 part of red marl, and
1 part of brick clay.

Vessels made of the above mixture are in possession of the Society. The colour of the body is a reddish cream brown: it is harder, more compact, and less porous than the common red ware; and its general adoption, with the above-mentioned glaze, would contribute, in no inconsiderable degree, to the health of the lower classes, by whom alone the common red ware is used for vessels of cooking.

ENGLISH PATENTS.

To James Falconer Astlee, *for a method of condensing wood, and giving it a closeness of grain for resisting moisture, for the construction of furniture and other purposes.*

The timber is cut into planks with parallel surfaces: these planks are passed between polished iron or steel rollers, the pressure of which condenses the wood. The pressure thus applied, must at first be small, and afterwards gradually increased; otherwise the wood will be crushed or split. The best way of applying the principle is to place several pairs of rollers behind each other, the distance between each pair gradually and progressively diminishing. The sap, or moisture will thus be forced out of the pores of the wood, at the ends and sides of the plank, and it will thus be rendered stronger, heavier and harder, and less pervious to moisture than in its natural state. When used in furniture it is less liable to scratch, and does not shrink. Oak and Mahogany admit of much more compression than Fur and other slight woods; and Honduras (bay) Mahogany, may be rendered as hard and as heavy as the best Spanish. If one of the rollers is sufficiently bright, a finished polish will be left upon the surface.

This plan, it is said, will be particularly useful in ship carpentry, for making wooden bolts, trenails and dowels of a compact quality.

The Editor doubts the correctness of the principles upon which the foregoing patent is founded. Every workman in wood, knows that if any part of a plank is accidentally indented, and is afterwards planed over, this part will swell out by the action of moisture. The process mentioned in page 181 of this Journal, depends upon this circumstance; the same effect will be as certainly produced upon a large, as upon a small surface, a plank thus condensed, if partially wetted, will swell in such part, and if exposed entirely to moisture, will expand throughout the whole mass. If the surface is to be polished by means of the rollers, it must first be made perfectly smooth, as

any roughness left upon the grain, could not be removed by the aid of the rollers; but little advantage would result from such a polish, as there are very few purposes to which the plank could be applied, without working it after it had passed through the rollers. Trenails and dowels may probably be improved by the process, as they may drive more readily, and by their expansion afterwards, may hold more firmly, than when driven in the ordinary way.

In the London Mechanics' Magazine, for 1823, it is mentioned that a piece of plank had been exhibited to the ship carpenters, and to others, which had been reduced, by compression, from six to three inches in thickness. The plank was of oak, the method employed is not stated, but it is averred that it was as hard as ebony, and shewed the growth of the timber as perfectly as the piece from which it had been cut.

Specification of the Patent granted to JOHN GUNBY, *of New Kent Road, in the county of Surrey, Sword and Gun Manufacturer, for a process by which a certain material is prepared, and rendered a suitable substitute for leather.* Dated February 28, 1824.

To all to whom these presents shall come, &c. &c. *Now know ye*, that in compliance with the said proviso, I, the said John Gunby, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in the following description thereof (that is to say:)—I take woollen or linen cloth, of any requisite thickness, or a mixture of linen and woollen, or linen, cotton, and woollen, or felt, &c. as all these fabrics are convenient for my purposes. For such articles as require a pliable quality for the manufacture of ties for women's pattens, &c. I make a composition as follows:—Common glue size, in a state of jelly, about one part; fat boiled linseed oil, about four parts; lamp black, about half a part; white lead, as ground in the mill, about one part; pipe-clay, ground fine, about one part; litharge, ground fine, two parts. When the glue size is sufficiently melted at a moderate heat, add the boiled linseed oil by degrees, keeping the mixture in constant motion, until completely blended, and which will be effected in a few minutes. Then add the lamp black, white lead, and pipe-clay, and litharge, and when all are melted, and quite free from lumps, let the whole simmer for half an hour or more, by which means the composition will become much thicker, and consequently much firmer for the intended purpose; then the composition is ready to apply to the cloth. The readiest mode, I find, is to strain the cloth on a frame (or frames) of such dimensions as is most convenient; and with a proper size pallet knife (or any other convenient way) apply the composition (in a warm state) to the cloth, taking especial care the cloth is well filled with the said composition, so that when dried and cut it is found to be thoroughly saturated. When the cloth is so prepared, let the frames be placed where there is a circulation of air, or in a moderately warm room, according to the season of the year,

as it is material the composition should be dried gradually. When the first coat of composition is found sufficiently dried, add a second, or third, or fourth coat, as may be thought requisite, taking care each additional coat is laid on as thin as possible (as a superabundance would prevent the desired pliability,) leaving the surface every time as smooth as it can be made; and should such care not yield a surface so even as may be wished, let the cloth be cut into strips, of a proper breadth for patten ties, &c. and placed between iron or other plates, and passed through rolls, worked by a horse or mill, or manual power, by which means the surface may be made as even as the plates themselves. When I have proceeded thus far, I take oil or varnish colour, of any tint required; and when these coatings are dry and the surface assumes a japanned appearance, the operation is complete, and the material ready to be cut up into patten ties, &c. such ties, &c. being finished in dies under a press or stamp, similar to raising impressions on paper, metal, or horn. For purposes which do not require to be so elastic, such as for carriage tops, &c. &c. I add glue, size, and pipe clay, and white lead, in such proportions as the nature of the surface demands; and when the pieces are so large as to be inconvenient to pass through rolls, the surface may be rubbed down from time to time with pounded pumice stone, tripoli, &c. and then the oil or varnish colour applied as often as found necessary for the purpose intended.

To Thomas Attwood, *of Birmingham, in the County of Warwick, Manufacturer, for his Invention, and having brought to perfection an Improved Method of making a Nib or Nibs, Slot or Slots, in Copper Cylinders, or Cylinders of other Metal used for Printing Cottons, Linens, Silks, Stuffs, and other articles.* Sealed 26th February, 1825.

In the improved modes of printing silks, calico, and other fabrics, cylinders of copper have, of late years, been employed, in place of flat plates or wooden blocks; upon the surfaces of these cylinders, the subjects to be printed have been engraved, and on the pattern becoming old fashioned, the surface has been turned away, and a new pattern engraved. This necessarily reduced the diameter of the cylinders, and rendered their adaptation to the printing machinery inconvenient, in consequence of not being all of one size, and the appropriation of an entirely new cylinder to every newly engraved sub-

ject being an expensive matter, induced the present patentee to introduce a mode of soldering cylindrical shells of copper upon rollers of iron or steel, and to displace those copper shells, and solder on new ones as often as the subjects required to be changed. For this practice, the inventor obtained a patent in June, 1823.

The present invention is a further improvement in the construction of printing cylinders, to be made of copper, or other suitable metal, which consists in making hollow cylinders for the purpose of introducing an iron or steel axle; these are to be held together by means of nibs, or protuberent pieces falling into slots or recesses.

The iron or steel axle is first to be prepared, as shown at Fig. 1, by turning it in a lathe. At each end of the axle, the shoulders and recesses, *a a*, are formed, upon which it is to revolve in the printing machine, and the middle part of the axle is made nearly cylindrical, very slightly tapering towards one end. A rising piece is to be left at the larger end, for the purpose of forming the nibs or protuberent pieces, *b b*, which are to be cut or filed out of the solid to their shape. At the reverse end of the axle, the recesses, *c c*, are to be made by cutting away the metal; and when this is done, the axle may be considered as complete.

The hollow cylinder shown, detached at fig. 2, is to be made from an ingot of copper turned in a lathe, on the outside to a smooth, and perfectly cylindrical periphery; it is then to be bored on the inside in the following manner. First, make a hole entirely through it; and then, with another tool something larger, bore it again within about two inches of the end, leaving a ledge out of which the nibs, *d d*, are to be formed, as seen in the end view, fig. 3. These nibs are intended to fit into the slots or recesses, *c c*, of the axle. At the reverse end of the hollow cylinder, the internal slots or recesses, *e e*, are formed by cutting away the metal, as shown in the end view, fig. 4; which slots are intended to receive the nibs or protuberent pieces, *b b*, on the axle. The hollow cylinder is to be properly hammered or drawn through a hole, in a steel draw plate, by which the copper will become elongated upon the axle, and adhere to it with firmness.

The advantages of these improved rollers or cylinders for printing, are, that many copper cylinders may be fitted and adapted to one iron or steel axle, and shifted at pleasure, which will save a very great expense in the cost of printing cylinders; and when the engraved subjects require to be changed, another cylinder may be put upon the axle, and made fast by drawing through a steel hole as above mentioned; which improvements are said to produce stronger rollers than those made of solid copper, and less expensive, which is a great object, as the same copper is not applicable to printing rollers after having been re-melted.

The patentee concludes by saying, though I have shown in the drawing, three nibs and three slots in each cylinder and axle, I do not mean to confine myself to that number, as one or two may be sufficient under some circumstances, or three, four, or any other number may occasionally be found desirable; neither do I mean to confine myself to any particular dimensions, as that will depend upon the goods to be printed.

FOR THE FRANKLIN JOURNAL.

MECHANICAL JURISPRUDENCE.—No. 6.

BY P. A. BROWNE, ESQ.

*On Mechanics' Liens.**

As regards the lien of the Vender of a Lot.

Rule. If the owner of a Lot makes a parol agreement to sell it, and puts the Vendee into possession, who proceeds to erect a building thereon, and, in so doing, contracts debts with mechanics and material men, the claim of the vender, for the purchase money, will be preferred to those of the lien creditors.

The case, in which this point occurred, was Kline *v* Lewis in the Court of Common Pleas of Philadelphia County in 1820. MS. [decided by Judge Hallowell.]

As regards a rent.

Rule 1. If a Lot is granted on a perpetual rent charge, and the grantee afterwards builds a house, in doing which he contracts debts to mechanics and material men, their claims must be deferred to the rent.

Rule 2. But if, after the commencement of the building, the premises are incumbered with a rent charge, the claims of the mechanics and material men will be preferred.

Rule 3. The owner of a Lot and building, upon which mechanics' liens have been created, cannot make a lease for years of the premises to the prejudice of the mechanics and material men.

This principle may be collected from the reasoning and admissions in the case of M'Call *v* Lenox in the Supreme Court, 1823. [MS. That case was as follows. Peter L. Berry being seized in fee of a house and lot, the N. W. corner of Chesnut and Tenth Streets, mortgaged it to Thomas Armstrong by deed, dated the 12th Sept. 1813. Berry retained the possession, and afterwards, on the 4th February, 1814, made a second mortgage, accompanied with a judgment bond, to Miles H. Hughes, who assigned this mortgage and bond to Daniel Man. On the 5th of May, 1814, Berry made a lease to the plaintiff, (who was then in possession, under a former lease from Berry,) for the term of two years, to commence on the 1st of May, 1815, on which the plaintiff paid all the rent in advance. On the 4th of February, 1815, Daniel Man, assignee of Hughes, entered judgment against Berry, on the bond which accompanied his mortgage, and by virtue of a *fieri faciàs* and *Venditioni Exponas* issued on this judgment, the mortgaged premises were taken into execution and sold to the defendant, who received a deed from the Sheriff, dated 3d November, 1815. The purchase money was applied first to the payment of Armstrong's mortgage, and afterwards to the payment of Man's, as far as it would go, but was not sufficient to pay the whole. It was contended by the plaintiff, that the lease made by Berry was

* The last essay was, by mistake, marked No. 4. It ought to have been 5. The present number completes the subject of Mechanics' Liens, the next will commence that of the Patent Laws of the United States, and of England.

good against the defendant, who was the purchaser at Sheriff's sale; but a majority of the court were of a different opinion, and part of the reasoning and admissions of all the judges, will apply with equal force to the case of sale, under a mechanics' lien, where the lease is made *after* the commencement of the building.

The 4th general question regards the *time* the lien may exist.

This leads to the following considerations.

1. When the lien is *indefinite.* 2. Whether it is necessary that it should be *revived* like a judgment. 3. What will operate as an *extinguishment* or *destruction.* 4. When it is limited.

1. *When the lien is indefinite.*

Rule 1. If an action for the recovery of the lien be instituted or the claim be filed, in the office of the Prothonotary of the county, within six months after performing the work, or furnishing the materials, the lien is *indefinite as to duration.*

This is the necessary consequence of the first proviso in the 1st section of the law of 1806, namely, "Provided always that no such debt for work and materials *shall remain* a lien on the said houses, or other buildings, longer than two years from the commencement of the building thereof, unless an action for the recovery of the same, be instituted, or the claim filed within six months after performing the work, or furnishing the materials, in the office of the prothonotary of the county."

If the suit is brought or the lien is filed within the six months, the condition is performed, and the lien *does* remain *longer than two years;* but how long, the legislature have not said; therefore, its duration is *indefinite.*

2. *Whether it is necessary that it should be revived like a judgment.*

A mechanic's lien does not require to be revived by a *scire facias,* like a judgment.

* In the case of Knorr *v.* Elliott, and another, 5th Sergeant & Rawle, 49, it was endeavoured to establish the position, that the mechanics' lien, when filed, was in nature of a judgment; and that, therefore, like a judgment, it must be limited to five years, as judgments are, by the act of the 4th day of April, 1798; but the court were of opinion that it did not expire at the end of five years.

3. *What will operate as an extinguishment or destruction.*

Rule 1. If the lien creditor performs the condition of the 1st section of the act of assembly, by filing his claim within six months, his lien will not be injured by his taking a bond and warrant of attorney for the amount of his debt and entering it up in the Prothonotary's office.

* By an act of assembly, passed the 4th April, 1798, it is enacted, that "no judgment thereafter entered, in any court of record, within this Commonwealth, shall continue a lien on the real estate of the person against whom such judgment may be entered, during a longer term than five years from the first return day of the term of which such judgment may be so entered, unless the person who may obtain such judgment, or his legal representatives, or other persons interested, shall, within the said term of five years, sue out a *scire facias,* to revive the same."

The ground upon which it was contended that such a lien was defeated, was this. It is a rule of law, that the acceptance of a *higher security* than the creditor had before, is an *extinguishment* of the first debt. It was contended that the bond and warrant of attorney, was a security higher than the simple contract debt of the lien creditor, which operates as an extinguishment; and again that the judgment which was a still higher security, had the same effect. But the court were of opinion, that the lien, when filed, was a security superior to the bond, and as to the judgment, *that* did not destroy the lien, owing to the peculiar nature of it, under the provisions of the act of assembly. That although there was a judgment, yet there still existed, in contemplation of the act of assembly, *a debt on account of materials furnished to the building*. The case will be found in 2 Browne's rep. 207, the case of John Thompson.*

With respect to the *destruction* of a lien, the following are the most important points.

Rule 1. A sale of the premises by the sheriff, under legal process, destroys the lien upon the building; thenceforth the purchaser holds the premises clear of the lien, and the mechanics' and material men divide the fund created by the sale.

Rule 2. And this will be the effect, whether the sale is made under a mechanic's lien or under a judgment.

In the case of Gorgas, &c. *v.* Douglas, reported in 6 Sergeant and Rawle, 512, it was made a question, whether a subsequent judgment creditor could sell a property liable to mechanics' liens, so as to discharge it therefrom.

It was said that the lien operated as a pledge of the specific property, which can be relieved only by payment of the whole debt, or by payment of part under a *sale by a lien creditor*. But the judges of the District Court were of a different opinion; they said that the act of 1806, did not prohibit, but contemplated a sale of the premises by *any* creditor, and a distribution of the money *pro rata*; but prefers the lien of the material men, &c. before other liens, originating subsequent to the commencement of the building. If a sale could be made for the mechanics' liens only, then a judgment creditor might be delayed, till the property was wasted; whereas, there was no inconvenience in allowing *any* creditor to sell.†

4. *When it is limited.*

Rule 1. If the lien is *not* filed, nor the suit brought within six months after performing the work, or furnishing the materials, the lien remains two years from the commencement of the building, *but no longer*, and therefore where no claim is filed or action brought

* It is proper here to remark, that Judge Duncan, in delivering the opinion of the Supreme Court, in the case of Williams *v.* Tierney, 8 Sergeant and Rawle, 58, makes use of this expression—"It is not required to give an opinion whether the taking a bond with warrant of attorney, and judgment confessed on it, extinguishes the lien, a matter which, when it comes in judgment before the court, will require very grave consideration."

† Upon this point the Supreme Court gave no opinion.

within six months, but a suit was instituted and judgment obtained within two years, and the building was sold *after* the expiration of two years, the *judgment creditors* were preferred.

In the above case it was confessed, that the lien creditors did not bring themselves within the words of the law, for they had not sued or filed their liens within the six months, but the merit of their claim over the other judgment creditors, rested upon the circumstance of their having instituted suits and recovered judgment *within two years.* But this did not avail them. Hemphill, President, delivered this as the opinion of the court.

The 5th general question relates to the *manner of entering a lien,* or instituting a suit.

As respects entering a lien, we must attend to *the form*; *the substance*; and to *joint liens.*

As respects the suit, *whether entering up a bond and warrant of attorney is a suit?—Where the suit must be brought?*

The form of entering a lien.

The Act of Assembly points out no particular *form* of the claim to be filed in the office of the Prothonotary, and various forms have been used. But the following rules must be observed.

Rule 1. As the object of the filing the claim is to give notice of the incumbrance, the building should be described with *convenient certainty,* that persons searching the records may know against *what* house it is that the claim is filed.

There is a case now pending in the Supreme Court, where the question is, whether the following description is sufficient, "a three story house on the south side of Walnut Street, between Eleventh and Twelfth Streets."

Rule 2. The *owner* or *reputed* owner's *name* is mentioned.

This is done that the lien may be found upon searching in the name of the person; the index or roll being kept in alphabetical order, for the convenience of search.

Rule 3. The creditor is described by his *business.*

As the law grants him the lien in his *character* of *mechanic* or *material man,* that character ought to be *stated,* that the Court may judge whether he is included in the terms of the Act of Assembly.

Rule 4. The *kind of work* or *materials* are particularly described.

This is also done that the court may judge whether they are of the *description* contemplated by the act.

Rule 5. The *amount* should be stated,

That persons wishing to purchase, or loan money on the premises, may know what is the amount of the claims.

I would further observe that the act contemplates the *real* amount to be mentioned, for it provides, that in case, after payment, satisfaction is not entered, any sum not exceeding one half *the debt* for which the claim was filed shall be recovered.

Of *Joint Liens.*

Rule 1. Several *houses belonging to the same person* are sometimes included in one general lien. The District Court for the City and County of Philadelphia have decided this to be incorrect.

Rule 2. If materials are furnished to *several* houses belonging to *several* persons, and a joint lien be filed, it will be *void.*

This was decided in the case of Gorgas, surviving partner of Warner, *v.* Douglass. Warner and Gorgas, lumber merchants, filed their claim against Francis Douglass, owner or reputed owner, for materials furnished in erecting *three* houses. Douglass was the owner of *one* house only, and acted as *agent* for the owners of the other two, and the question decided was, whether the lumber merchant could file his claim affecting the *three houses jointly*, and making *each* liable for the whole debt.

Rule 3. If a joint lien is thus improperly filed against several houses owned by *several* persons, the party will not be permitted, at the trial, to give evidence of what lumber was furnished to each house, to ground a *separate* recovery. This also was decided by the Court in Gorgas *v.* Douglass, 6 Serjeant and Rawle, 512.

Respecting *the suit.*

Rule 1. The lien may also be perpetuated by *instituting a suit.*

Rule 2. But taking a bond and warrant of attorney, and entering a judgment on it, is not instituting a suit within the meaning of the Act.

This question came before the Supreme Court in the case of Williams *v.* Tierney, reported in 8 Serjeant and Rawle 58. The case was this, the mechanic who had done work for a building, took the owner's bond and warrant of attorney for the amount, and entered up judgment thereon, but he filed no claim in time, nor instituted any suit on the original account. The only question was, whether that preserved the lien, and the court decided that it did not.

Where the *suit* must be brought.

Rule. The action contemplated by the act, must (in this County) be instituted in the Court of Common Pleas, District Court of the City and County, or the Supreme Court; an action brought before an *Alderman* or *Justice of the Peace* will *not* suffice.

This was decided by the Judges of the District Court, for the City and County of Philadelphia, in the case of Sharp *v.* Reese, in April, 1816.

We must, 6thly, inquire into the *proceeding* to recover the amount of a lien.

Under the law of 1806, the remedy was *personal only.*

The act of assembly of 1806 gave no remedy to recover a lien but a personal action, which, for want of a proper person on whom to serve the process, often occasioned a failure of justice. It was to remedy this inconvenience, that the 2nd section of the act of 1808 was passed. By this act, the proceedings to recover the debt of the mechanic or material man are twofold. 1. By personal action against the debtor, his executors or administrators. 2. By *scire facias* against the debtor and owner of the building, or their executors and administrators.

When a personal action is brought, it has been usual to insert in the declaration, that the work was done, or the materials were found and provided for, or in the erecting and constructing of the dwelling house or other building (describing it.) This practice is convenient,

as it facilitates the means of inquiry into the claims, but it would seem from an expression in the opinion of the court, (Duncan J.) in Williams *v.* Tierney, that it is not absolutely necessary. See page 60, 8. S. & R.

Rule. If the remedy is by *scire facias*, it must necessarily follow the nature of the contract; and the plaintiff's must be the same as if a personal action in assumpsit had been instituted. And therefore if *one* of several persons who ought to have joined in such *scire facias* brings an action alone, it may be taken advantage of on the *general issue*. The case of Howard *v.* M'Kowen, 2 Browne's report, 150, was this; Howard and Wharton furnished lumber for a building; they afterwards dissolved partnership, all the debts being transferred to Howard, and a claim was filed, and a *scire facias* was issued in the name of Howard. It was objected that the claim ought to have been filed, and the scire facias entitled in the name of the *firm;* and of this opinion were the court.

The 2d section of the act of 1808, directs, that the *scire facias* may be served in like manner as a summons, (that is, by delivering a copy, personally, or leaving it at the dwelling house, with one of the family;) if they can be found, within the county in which the building is situate, or are resident therein, or by fixing a copy of the writ upon the door of the building against which the claim is filed.

Upon the return of service and non-appearance, the court are authorized to enter judgment, as in case of a summons, that is judgment by default.

As the writ discloses the whole cause of action, no declaration need be filed. Ridgway *v.* Hess, 1 Browne's rep. 347.

If the defendants appear, they may plead and make defence, and the like proceedings shall be had as in personal actions for the recovery of debts.

The pleas generally put in, are *non-assumpsit*, that the defendant did not assume to pay the debt, or *payment*. The judgment rendered in the *scire facias*, warrants an execution to issue, only, against the building or buildings, upon which the lien existed.

The proviso says "that no judgment rendered in such *scire facias*, shall warrant the issuing an execution, *except against* the *building* or *buildings* upon which the lien existed, as aforesaid."

The consequence of a deficiency of assets to pay all the lien creditors, is the next division of our subject.

It often happens that the building and lot when sold, do not together, yield enough to pay for the work and materials expended in the erection of the building. The act has provided for these cases by declaring that "if such house, or other building, should not sell for a sum of money sufficient to pay all the demands for work, and materials, then and in such case, the same shall be averaged, and each of the creditors paid a sum proportioned to their several demands."

In order to ascertain the amount of the liens, it is the practice of the court, *with the consent of the parties*, to appoint a commissioner, who collects all the facts and lays them before the court.

But this is by consent, for in the case of Lyle *v.* Ducomb, the judges of the Supreme Court disclaim any such authority.

The court have power to direct an issue to be formed to try disputed facts.

The eighth and last head, is the *duty of the lien creditor* upon the receipt of his debt.

Rule 1. It is the duty of every lien creditor as soon as he has received satisfaction of his demand, to enter satisfaction upon the record of his lien.

This is required by the 2d proviso of the 1st section of the act of 1806.

Rule 2. And if satisfaction is not entered, a suit may be instituted, and any sum not exceeding one half the debt may be recovered

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In the paper by Mr. Bull, on the subject of fuel, that gentleman has described his method of obtaining charcoal, by surrounding the pieces of wood to be charred, with pulverized coal, by which a product is afforded, equal in every respect to that made in cylinders, or retorts of iron, (see p. 277, 278) The editor has seen some of the charcoal made upon this plan, in the large way; its superiority to that produced by the common process, was very striking. The plan proposed can be pursued with facility, and without expense; and the great saving of wood, from the increased quantity of coal obtained, is a circumstance which renders it of national importance.

Perhaps the surest mode of calling the attention of those more immediately interested, would be for Mr. Bull to obtain a patent for the process. That for which we are forced to pay, we are most apt to value.

Observations on an improved mode of Charring Wood, in the large way. By MARCUS BULL.

From the experiments mentioned, p. 277, 278, it occurred to me, that an important improvement might be made in the common process of making charcoal, by filling the interstices between the sticks of wood with the culm, or fine coal, left on the ground after the large coal has been drawn from the pit; and by covering the wood more perfectly than is usually done. In this way we may more completely prevent the access of air, which is not only destructive, in many cases, to a large portion of the coal, but also renders what remains less valuable.

That my remarks on the subject may not be considered as entirely theoretical, it is proper to state, that an intelligent collier in New Jersey, applied, in a partial manner, the plan proposed. He found the product to be about 10 per cent. more in quantity, *by measure*, than he had ever before obtained from the same kind and quantity of wood: and I also found the coal, when brought to market, nearly 20 per cent. heavier than usual. As an evidence that the coal had been well charred, (a circumstance too often neglected) the hy-

drogen appeared to have been almost entirely expelled, as it lost very little in weight by exposing it to a red heat in powdered charcoal.

The quality of this coal was considered by competent judges to be superior to any other ever offered in this market; it was as cleanly to handle as anthracite coal, and sold readily at an advanced price.

From an examination, made during the last summer, of the common manner of piling and covering wood which is to be converted into charcoal, the practice of piling it two, and sometimes three tiers in height, appeared to be objectionable for two reasons; the first was, that the second and third tiers cannot be so well defended from the air as the first, which rests upon the ground; this being a better barrier against the air, than the ordinary covering can be made to present; and the second that this disposition of the wood is not favourable for producing the ignition of the whole mass at one and the same time; the usual practice being either to commence the ignition in the centre of the upper tier, or, to drop the fire into a hole, or chimney, left in the centre of the pile, which extends to the bottom, or ground; leaving air holes also, at the sides, by which, (to use the language of the colliers,) the fire is said to be drawn to the sides of the pit.

It is very true, that the fire does eventually extend to the sides of the pit; but a much more uniform and speedy process, and one by which less loss would be sustained, would be to place the fire, in the first instance, in a number of holes at the sides, near the bottom, leaving an opening at the top, by which the heat generated at the sides, would be communicated to the wood in the interior, and facilitate the uniform ignition of the whole mass; at the moment this is effected, the holes at the sides should be closed, and that at the top might be lessened, but should not be wholly closed, until the extrication of hydrogen gas has nearly ceased, as this gas, from its prodigious expansion, sometimes bursts the pit; this generally occurs when the wood is well covered, and sometimes produces very injurious effects, by firing the adjacent woods, (the column of flame having been known to extend from twenty to thirty feet,) and has probably led many colliers into the belief, that the proper remedy is to give the wood a slight covering, by which numerous escapes are allowed for the gas; but in effecting this object, as the holes at the sides are left open, a very strong current takes place through the pit, from the slightness of the covering, whilst another evil is produced, that of burning through the sides of the pit.

In those instances where pits have been known to burst, when well covered, the cause may probably be traced to the chimney at the top, having been too soon closed, this being generally done in about fifteen minutes after lighting the fire: and also, to having left those at the the sides open too long: as the gas will make its escape in some manner, this should be provided for; this provision is as necessary to a coal pit, as is the safety valve to a steam boiler.

Both the objections which I have made, against piling the wood two or three tiers high, may in part be remedied by changing the manner of igniting the wood, in the way proposed; and if clay and sand can be procured, the former should be used as a covering, and

the latter placed on the top to fill the cracks as the clay dries, these should be preferred in all cases, and the evils may thus be lessened; but undoubtedly, the best manner is, to pile the wood in single lengths, and if the fine coal is used to fill the interstices, and can be made subservient in its combustion to produce the required heat, or any portion of that necessary to char the wood, that portion which can be so used, is as effectual as the combustion, and saves an equal portion of the charcoal. The process being, when conducted in retorts, similar to that of distillation, those portions of the wood, which it is necessary to expel being volatile, no necessity exists that any combustion should take place either in the wood or coal: yet this cannot be entirely prevented, in the common process, unless some means be devised to burn the hydrogen gas which escapes, and make it applicable to produce the heat necessary to char the wood, as is done when the process is conducted in retorts. The hard texture of the coal will be in proportion to the heat given to it, and the perfect exclusion of the air; the advantage therefore of using clay will be obvious, from its being a bad conductor of heat, and a good barrier to exclude the air.

I have been informed by a gentleman well acquainted with the iron works in this state, that in consequence of the growth of the extensive forests belonging to the works, not being sufficiently rapid to furnish a constant supply of charcoal, many of them are obliged to suspend their operations, about three months in each year, by which very great loss is sustained. If an improvement can be made in the manner of producing the charcoal required, by which these works, and all others similarly situated, shall be enabled, from their present forests, to continue their operations, during the whole year, without interruption, such an improvement must be considered as important, not only to individuals, but to the community generally.

It is my intention, so soon as my other avocations will permit, to make some further experiments in the charring process in the large way, and to use the fine coal as suggested; for which purpose a number of cords of wood have been cut for a considerable period of time.

Observations on the experiments which have been made to ascertain the law which obtains in the cooling of heated bodies; and on the applicability to that purpose, of the apparatus used in the "Experiments to determine the comparative quantities of heat evolved in the combustion of the principal varieties of wood and coals, &c." By* MARCUS BULL.

Numerous experiments have been made to determine the law which obtains in the cooling of heated bodies. My apparatus, although it did not admit of making experiments on this subject at high temperatures, yet appeared in one respect better adapted for the purpose than any other which has, to my knowledge, been made use of; because we are enabled by it, to maintain both the heated body, and the re-

* This article originally made part of the paper published in our last number.

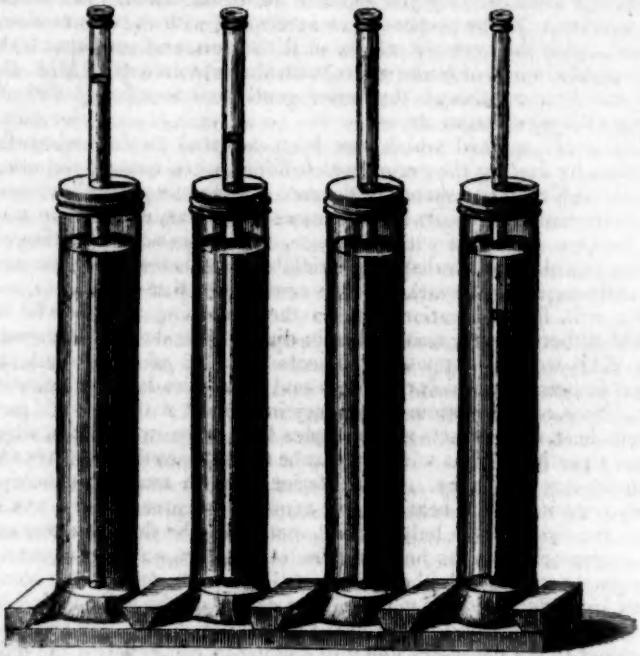
frigerating medium, at the same *difference* of temperature, for a sufficient period of time, to determine the question with accuracy. My experiments consisted in maintaining the temperature of the interior room 10°, 20°, 30°, and 40° above the temperature of the exterior room for the same period of time; and the quantity of fuel required was found to be directly proportioned to the increased difference in temperature. These results are in agreement with the assumption of Newton, with the geometrical law of Richmann, and correspond also at these differences of temperature, with the experiments of MM. Dulong and Petit; although the latter gentlemen found very different results at higher temperatures.

The usual method which has been adopted to determine this question, by finding the period which fluids, when heated, require to cool through a given number of degrees in different parts of the scale of a thermometer, appears liable to some objections, which it becomes me, however, to notice with deference. The form or size of the containing vessel is not, perhaps, material, but as spheres have been most generally used, my remarks will be confined to that shape.

We will, for illustration, assume the containing vessel to be the bulb of a thermometer two inches in diameter, and filled with mercury. This we will suppose to be heated to 300° of Fahrenheit, and placed *in vacuo*, in which case it is said to lose its heat by radiation only. Now, as the stratum of mercury in contact with the bulb, parts with its heat, it contracts and occupies less space in the bulb, which causes a portion of that within the tube to sink into the bulb in order to supply the deficiency. This exterior stratum must then be supposed, from its loss of heat, to have acquired greater density, and to leave the sides of the bulb; hence, *motion* in the fluid commences, and in proportion to its heat will be its mobility, and consequently, the velocity with which the change will be made, and as the strata lessen in volume as they approach the centre of the bulb, their heat must either be transmitted through the exterior intervening strata, or be subject to the necessary delay in coming in contact with the bulb, in consequence of the decreasing velocity with which the changes are made; and, in either case, the cooling process will be retarded. If we suppose the fluid, under the circumstances described, incapable of locomotion, it will not be denied that the interior strata will require more time to impart the same heat, than the exterior, consequently, proportional to the cooling of the body must be the increased time required to deprive it of any given number of degrees.

Experiments upon this subject would be much more satisfactory, and would probably give different results from those hitherto obtained at high temperatures, by using an apparatus which should admit of maintaining the heat at fixed points upon the scale of the thermometer; in which case, motion in the fluid would be immaterial, and an equally heated surface would always be exposed to the refrigerating medium.

A NEW METHOD OF DEMONSTRATING THE EXISTENCE, AND THE EXTENT, OF THE PRESSURE OF THE ATMOSPHERE. BY ROBERT HARE, M. D. PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF PENNSYLVANIA.



For the pressure of any fluid upon any area assumed within it, the pressure of a column of any other fluid, having the said area for its base, may be substituted; provided the substituted column be as much higher, as lighter, as much lower, as heavier; or, in other words, the heights of the respective fluids must be as their gravities, inversely.

Let there be four jars, each about four inches in diameter, and more than thirty inches in height—severally occupied by mercury to the depth of about two inches. In the axis of each jar, let a tube be placed, of about one inch and a half in diameter, and about one-fourth taller than the jar, with both ends open, and the lower orifice under the surface of the mercury. On pouring water into the jars, the mercury rises in the tubes, as the water rises in the jars; but the mercury rises as much less than the water, as it is heavier.

The mercurial columns are evidently elevated by the pressure of the surrounding water, and, by their height, measure the extent of that pressure on the areas, of their bases, respectively. They may be considered as substituted severally for the aqueous columns, which

would have entered the tubes, had not the mercury been interposed. Accordingly, water being poured into one of the tubes, the mercury in that tube, subsides to a level with the mercury without; when the water (poured into the tube) reaches the level of the water without.

In this experiment, columns of mercury have been substituted, in water, for columns of this fluid, and are found adequate to preserve an equilibrium with it, being as much lower as heavier. It remains to be proved, that other fluids, heavier, or lighter, than water, may in like manner be substituted for the columns of mercury, and of course for the water, of which the mercury is the representative.

Into the three tubes, in which, by the addition of water in the jars, columns of mercury are sustained, pour severally, ether, alcohol, (differently coloured, so that they may be distinguished) and a solution of sulphate of copper, until the mercurial columns within the tubes are on a level with the mercury without. It will be found, that the column formed by the cupreous solution, is much lower than the surface of the water on the outside of the tube: that the opposite is true of the column of alcohol; and that the ether (still more than the alcohol) exceeds the surrounding water in elevation.

While it is thus proved, that columns of mercury, ether, and alcohol, or of a saline liquid, may, in water, be substituted for columns of this fluid; it is made evident, that they must be as much higher than it, as lighter; as much lower, as heavier.

Pursuant to the law, which has been thus illustrated, that the pressure of one fluid may be substituted for that of another; provided, any difference of weight, be compensated by a corresponding difference in height; if, in lieu of water, the mercury were pressed by air on the outside of the tubes, unbalanced by air within, a column of the metal would be elevated, which would be in proportion to the height, and weight, of the air thus acting upon it.

In order to show that the air exercises a pressure analogous to that of the water on the surface of the mercury, outside of the tubes, in the experiments just described, it is only requisite, that this external pressure be unbalanced by the pressure of air within the tube.

This desideratum is obtained, by filling with mercury, a tube about three feet in length, open at one end, and closed at the other, and covering the open end, with the hand, until it be inverted and immerged in a vessel containing some of the same metal, without allowing any air to enter. A mercurial column of about 30 inches in height, will remain in the tube, which must be supported by the pressure of the surrounding air, and be an index of its weight. This is a case obviously analogous to that of the mercurial columns, supported by aquatic pressure, in the experimental illustration above afforded.

Supposing the base of the column of mercury thus sustained by the atmosphere, were equivalent to a square inch, the total weight of the column would be about fifteen pounds. This of course represents the weight of that particular column of air only, whose place it has usurped; and as, for every other superficial inch in the earth's surface, a like column of air exists, the earth must sustain a pressure from the atmosphere, equal to as many columns of mercury, 30

inches high, as could stand upon it; or equal to a stratum of mercury, of the height just mentioned, extending all over the surface of the globe.

It has been shown, that the height of heterogeneous fluids, reciprocally resisting each other, are inversely as their gravities; or, in other words, that they are as much higher, as lighter; as much lower, as heavier. The height of the column of air which, by its pressure, elevates the mercury, must, therefore, be as much greater than the height of the column of mercury, as the weight of the mercury is greater than the weight of the air; supposing the air of uniform density. Mercury is 11152 times heavier than air, and of course the height of the atmosphere would be (if uniform in density) 11152× 30 inches = 27.880 feet; supposing 30 inches the height of the mercurial column supported.

Hence the atmosphere, if of the same density throughout, as on the surface of the earth, would not extend much above the elevation ascribed to the highest mountains.

But as the pressure of the atmosphere causes its density, it may be demonstrated, that, the heights increasing in arithmetical progression, the densities will decrease in geometrical progression. Thus the density at 3 miles being, by observation, one half of what it is at the surface of the earth;

At 6 miles it will be	$\frac{1}{4}$	At 18 miles it will be	$\frac{1}{64}$
9 - - - - -	$\frac{1}{8}$	21 - - - - -	$\frac{1}{128}$
12 - - - - -	$\frac{1}{16}$	24 - - - - -	$\frac{1}{256}$
15 - - - - -	$\frac{1}{32}$		

or, rarer than we can render it by the finest air pump.

These results have been verified, to a considerable extent, by actual observation.

Observations on the May-Bug, and its ravages on Plum, and other Trees, and also on the means of preventing the mischief.

New Jersey, May 23d, 1826.

TO THE EDITOR OF THE FRANKLIN JOURNAL.

Sir—Being convinced, by observation, and by reading several papers on the subject, that our plums were stung by an insect for the purpose of depositing its egg, and having often seen the egg and the worm when hatched, I was determined both to learn the history of the insect, and to endeavour to prevent the mischief it caused.

The insect of which I speak, is called by some, the May-bug, or Doree-beetle. It belongs to the order *coleoptera*,* and it deserves the attention of every one interested in agriculture and horticulture. In three months after the eggs are deposited, either in the plum, cherry, apricot, peach, nectarin, or in the earth, this insect assumes the form of a small grub or maggot. If it be deposited in fruit, it works its way to the kernel, and the circulation being destroyed by its ravages, the fruit falls to the ground. The worm then crawls downwards, and finds its way to the roots of vegetables, on

* *Scarabæus Melolontha.* Linn.

which it subsists for *three years*, going lower and lower into the earth every winter as it increases in strength and size. When it has attained the size of ½ an inch caliber, and from an inch to 1½ inches in length, and has remained in the grub state for three years, committing every sort of waste and destruction; it digs its way down in the earth to the depth *of 6 or 7 feet*, when it scoops out for itself, a commodious habitation. It here shortens itself, swells, and finally bursts its last shell, and assumes the form of a chrysalis. This occurs in January or February, and in a little time, the beetle is formed. It remains in an inert and imbecile state, under ground, until the beginning of May, when it again commences its ravages, and after stripping the trees of their leaves, and perpetuating its species, it either returns to its holes and perishes, or else (its thirst being very great at the close of its career) it flies to ponds and rivers, and is seen no more. This is the formidable insect that preys on the industry of man. This is the *corn grub*, the *cut worm*, the *wood maggot*, the *potatoe worm*, the *cabbage worm*, and in short, occasions the loss of our Indian corn, of our cabbage, of our potatoes, of our fruit, and of our trees. There are many varieties of this mischievous insect, but this chesnut coloured beetle, is the worst, for its life is continued to four years, and at every stage, it does an immensity of mischief. It has unfortunately happened, that the rotation of crops in our district, has been favourable to the increase of this insect. Clover grounds and grasses, of every kind, being its hiding place during the day, whilst in the fly or beetle state. They are this year, more numerous than I have ever known them, at least, it so appears to me now that I have begun to understand their movements. I have thus far, at certain points, defended myself from their attacks, and if I ultimately succeed, I shall be well repaid for the labour it has cost me.

It is *possible* that pungent odours *may* deter them from alighting on a tree, but I doubt it; *actual manual* labour is the only preventive to the scourge. As soon as I became acquainted with their movements, and saw, or rather heard that they had commenced their destructive work, for they only leave their holes at dusk, I began to work. I spread a large sheet or wagon cover under a tree, and giving the trunk a sudden blow with the flat of the hand, the beetles fell on the cloth. Some young plum trees had from 40 to 60 large beetles clinging to their limbs, and leaves; but the slightest touch makes them drop as if dead. As soon as they dropped, I had them gathered and thrown into a *tin* pail of water, that was brought for the purpose. In this way I cleared 50 trees in half an hour. Two persons held a light, and two picked up the beetles. The quantity that we picked up the first night, is incredible. At dusk, the second night, we began again, and had not quite as many as the first night. They were reduced in number every succeding night; and last night I only found one or two on each tree, whereas, on the English walnut, and European ash, and other trees near them, I saw them as thick as ever. One plum tree, that stood a little out of our way, but which we had always stripped of the beetles, was forgotten last night, and I ob-

served, this morning, that several of the plums were stung. In a few nights, I think that these trees will be safe, for when they once commence laying their eggs, they disappear. The trouble is not worth a thought, compared to the benefit derived from it; I hope by ploughing deeply in the fall, and early in April, that I shall in a few years, get rid of these destructive insects. I am induced to believe, that the same set of insects frequent the same tree, and return to the same holes, that they occupied during the day. They are not more than ten minutes from the time that they first fly from the ground, until they all fasten themselves on a tree, and I think that if I could have staid that time at one tree, but very few would have been found afterwards on *that* tree, but I was obliged to go very quickly from tree to tree; of course many alighted on the same tree, after we left it. No one in my neighbourhood, this season, was aware of their existence; nor has any one pursued the same method of extirpation that I have; but I have taken great pains to make every one acquainted with the minute history of the beetle, and of my mode of destroying them; I hope that many others, now, will go seriously to work by fall ploughing, and by watching them in the month of May. I have entirely banished the peach worm, or fly, and I am certain that I can rid myself of the beetle.

I tried small bonfires, but although I destroyed myriads of ephemera, and many millers, yet but few beetles were either attracted by the light, or deranged by the odour.

I observe, too, that the locust is making its appearance, my woods are full of them. I am fearful that they are going to be troublesome.

A.

Society (in France) for the Promotion of National Industry.

This Society was established in Paris, many years prior to the revolution; after suspending its operations, it was revived in 1804, by the association of a number of persons eminent for their learning, statesmen, landholders, manufacturers and others, distinguished for the liberality of their views.

Its principal object is to second the efforts of the French government, for the improvement of all the different branches of National Industry. 1st. By the distribution of prizes and medals. 2d. By instituting experiments, to test the value of new processes. 3d. By advancing funds to aid artisans and manufacturers, in the construction of machines, and the completion of processes, of evident utility. 4thly. By the publication of papers, containing descriptions of discoveries relating to the useful arts, whether made in France, or in foreign countries; with drawings of such models, or machines, as may require them.

Such are the means adopted by the Society, for the attainment of the end proposed. Among the premiums offered we find the following:—

For the construction of a rasp, and of an economical press, for ex-

tracting the juice from beet root, for the purpose of manufacturing sugar, 2,700 francs.

For the manufacturing of paper, from the bark of the paper-mulberry tree, 4000 francs.

For the construction of a machine capable of shaving the hair from skins, so as to be suitable for the manufacturing of hats, 1000 francs.

For the construction of a mill, to clean buckwheat, 600 francs.

The following are the conditions, to be observed by applicants.

All models, memorandums, descriptions, patterns, &c. must be forwarded free of expense, to the office of the secretary of the Society, *Rue du Bac.* No. 24.

They must be forwarded before the first of May, in each year. The processes, and descriptions of machines, will be examined by a committee of the Society.

Foreigners are admitted as candidates. Should prizes be awarded to foreigners, the inventions are to be the property of the Society, excepting they are carried into operation, or a patent obtained for them in France.

Competitors are not to insert their names in their memorandums, but to inscribe a motto; this must be accompanied with a sealed paper, with the same motto on the outside, and containing their names and residences.

Persons who obtain prizes, are at liberty to secure their inventions by patent. *Bazar Parisien.*

New Patents for Inventions and Improvements, issued in the United States, from March 11th, to April 12th, 1826.

Improvement in the mode of dipping candles, March 11, William Day, Gardiner, Maine.

Being a machine for raising stumps, March 15, Abiezer H. Whitney, Bowdoinham, Maine.

In the mode of measuring garments, March 15, Stephen Severson, Baltimore.

In making shutters and doors fire-proof, March 16, J. Brown and G. W. Robinson, Providence, R. I.

Called the "ladies' spinner," March 16, George W. Robinson, Providence, R. I.

In the currying knife, March 17, Freeman Palmer, Littleton, Grafton county, New Hampshire.

In making paddle or culvert gates, March 17, Daniel Rodgers, Little Falls, Herkimer county, New York.

In concave and convex mill stones, March 18, J. Sawyer and E. Clark, Royalston, Mass.

In the spiral spring truss, March 21, Bela Farr, Norwich, Chenango County, New York.

In machinery for propelling machinery, March 22, James Cooper, Staunton, Augusta County, Virginia.

In the evolution of heat, March 23, Eliphalet Nott, Schenectady, New York.

In making bolts to locks for doors, &c. March 24, J. Brown and G. W. Robinson, Providence, R. I.

In the steering wheel for vessels, March 24, John M. Brown, Boston.

Called a sight-gauge for a steam boiler, March 24, Wm. Barker, Kingston, Luzerne County, Penn.

In the machine for dividing timber, March 25, do. do.

In the machinery of the pendulum and lever power, March 25, Atrice and Cyrus Berry, Pleasant Valley, N. York.

In the mode of applying steam, wind and water, as a joint power, March 25, Isaac Garretson, Bellefontaine, Ohio.

In the mode of moulding and striking brick, March 28, James Parker, Gardiner, Maine.

In the mode of preparing and grinding clay, March 28, do. do.

In the machinery for propelling boats, &c. March 29, Chauncey Crafts, Woodbury, Connecticut.

In the gas or vapour engine, April 1, Samuel Morey, Oxford, New Hampshire.

In Dry Docks, April 1, Alonson Place, New York.

In Heating Calender Rollers, for glazing cloth, &c. April 1, Joel Brimhall and Thos. Keyes, junr. West Boylston, Worcester County, Mass.

In the Bedstead Fastenings, April 3, Edwin H. Badger, Petersburg, Virginia.

In Nailing Boots and Shoes by a common last and iron tree, April 5, John Trask, Hadfield, Mass.

In the art of Tayloring, April 5, Greenberry Ross, Carlisle, Kentucky.

In the Cutters used in slitting mills, April 5, Timothy Allen, Plymouth, Mass.

In the mode of sawing shingles, April 6, Oliver Goddard, Bridgeton, Maine.

In the machine for jointing and matching boards, April 8, David Gleason and Hiram Frisbee, Betheny, New York.

In the wheel power for pumping vessels, April 8, Salem Town and Robert W. Oliphant, New York.

In the washing machine, April 12, Richard V. Mudge, Durham, New York.

In the cotton press, April 12, Gideon Glenn, Louisburg, North Carolina.

In the machine for manufacturing paper, April 12, Gardner Burbank, Worcester, Mass.

In the wire harness for weaving, April 12, Ezra Brown, Cazenovia, New York.

In the mode of crooking gun-stocks, April 12, John Schirer, Charleston, S. Carolina.

In the side hill cast iron plough, April 12, John Shephard, De Reuyter, New York.

FRANKLIN INSTITUTE—*Exhibition of* 1826.

Manufacturers and Mechanics are reminded, that the third annual exhibition of the products of their skill, will commence on Wednesday, the 3d of October, in the New Hall, erected by the Institute.

Articles may be deposited at any time after the first of August. Letters, (post paid) addressed to any member of the Committee on premiums, will receive immediate attention. The list of premiums offered may be seen in the first number of this Journal, and may be obtained gratis, upon application to the publisher.

Erratum.—In Professor Renwick's paper, where the fraction $\frac{1}{2\,1\,8\,7}$, occurs, read $\frac{1}{2\,6\,8\,,\,3}$.

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